

SERVICE MANUAL

PAL COLOUR TV RECEIVER RM-097 REMOCON SYSTEM CHASSIS NO, P-50

SAFETY CAUTION:

Before servicing this chassis it is important that the service technician read and follow the a "Safety precaution" and "Product Safety Notice" in this Service Manual.

SPECIFICATIONS

Receiving System	Standard PAL-B
Receiving Channel	VHF CH. 2 to CH. 12 UHF CH. 21 to CH. 69
Intermediate Frequency	Picture I-F carrier frequency 38.9 MHz Sound I-F carrier frequency 33.4 MHz Colour Sub-carrier frequency 34.47 MHz
Audio Output	0.8W at 10% Distortion (14")/1.5W at 10% Distortion (20")
Picture Tube	14", 20" inches measured diagonal, Electrostatic Focus, Bi-potential
Power Requirements	220V AC, 50 Hz
Antenna	VHF/UHF Telescopic dipole antenna (75 ohm unbalanced type)
Power Consumption	69 W (14")/83 W (20")

* For improvement purposes, specification and design are subject to change without notice.

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supplements; electrical components having such features are identified.

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X-RAY RADIATION PRECAUTION

1. Excessive high voltage can produce potentially hazardous X-RAY RADIATION. To avoid such hazards, the high voltage must not be above the specified limit. The nominal value of the high voltage of this receiver is 25.5 kV at zero beam current (minimum brightness). The high voltage must not, under any circumstances, exceed 27 kV.

Each time a receiver requires servicing, the high voltage should be checked following the HIGH VOLTAGE CHECK procedure on this manual. It is recommended the reading of the high voltage should be recorded as a part of the service record.

It is important to use an accurate and reliable high voltage meter.

2. The only source of X-RAY RADIATION in this TV receiver is the picture tube. For continued X-RAY RADIATION protection, the replacement tube must be exactly the same type tube as specified in the parts list.
3. Some parts in this receiver have special safety-related characteristics for X-RAY RADIATION protection. For continued safety, parts replacement should be undertaken only after referring to the PRODUCT SAFETY NOTICE.

SAFETY PRECAUTION

WARNING: Service should not be attempted by anyone unfamiliar with the necessary precautions on this receiver. The following are the necessary precautions to be observed before servicing.

1. Always discharge the picture tube anode to the CRT conductive coating before handling the picture tube. The picture tube is highly evacuated and if broken, glass fragments will be violently expelled. Use shatter-proof goggles and keep picture tube away from the bare body while handling.
2. When replacing a chassis in the cabinet, always be certain that all the protective devices are put back in place, such as: non-metallic control knobs, insulating covers, shields, isolation resistor-capacitor network etc.
3. Before returning the set to the customer, always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as antennas, terminals,

screwheads, metal overlays, control shafts etc. To be sure the set is safe to operate without danger of electrical shock. Plug the AC line cord directly into a AC outlet (do not use a line isolation transformer during this check). Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner:

Connect a 1500 ohm, 10 watt resistor, paralleled by a 0.15 μ F, AC type capacitor, between a known good earth ground (water pipe, conduit, etc.) and the exposed metallic parts, one at a time. Measure the AC voltage across the combination of 1500 ohm resistor and 0.15 μ F capacitor. Reverse the AC plug at the AC outlet and repeat AC voltage measurements for each exposed metallic part. Voltage measured must not exceed 0.3 volts RMS. This corresponds to 0.2 milliamp AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.

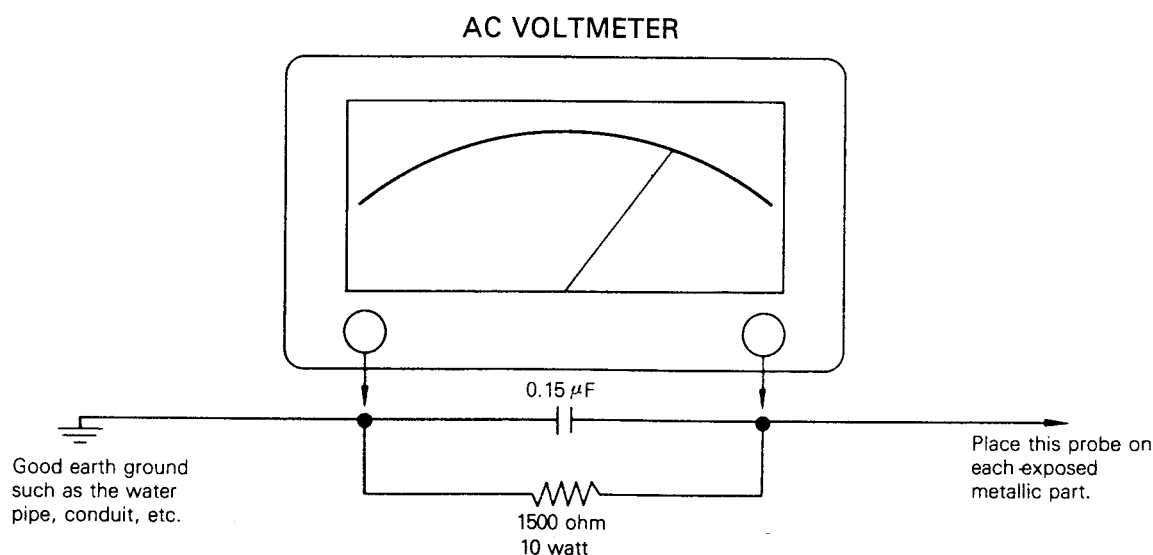


Figure 1. AC Leakage Current Check

INSTALLATION AND SERVICE ADJUSTMENTS

1. GENERAL INFORMATIONS

All adjustments are thoroughly checked and corrected when the receiver leaves the factory. Therefore the receiver should operate normally and produce proper colour and B/W pictures upon installation. However, several minor adjustments may be required depending on the particular location in which the receiver is operated.

This receiver is shipped completely in cardboard carton. Carefully draw out the receiver from the carton and remove all packing materials.

Plug the power cord into a convenient two pin power outlet.

Turn the receiver ON and adjust the fine tuning for best picture detail.

Check and adjust all the customer controls such as BRIGHTNESS, CONTRAST and COLOUR Controls to obtain natural colour or B/W picture.

2. AUTOMATIC DEGAUSSING

A degaussing coil is mounted around the picture tube so that external degaussing after moving the receiver is normally unnecessary, providing the receiver is properly degaussed upon installation. The degaussing coil operates for about 1 second after the power to the receiver is switched ON. If the set is moved or faced in a different direction, the power switch must be switched off at least 10 minutes in order that the automatic degaussing circuit operates properly.

Should the chassis or parts of the cabinet become magnetized and cause poor colour purity, use an external degaussing coil. Slowly move the degaussing coil around the face-plate of the picture tube, the sides and the rear of the receiver and slowly withdraw the coil to a distance of about 2 m before disconnecting it from AC source. If colour shading still persists, perform the COLOUR PURITY ADJUSTMENT and CONVERGENCE ADJUSTMENTS procedures, as mentioned later.

3. HIGH VOLTAGE CHECK

CAUTION: There is no HIGH VOLTAGE ADJUSTMENT on this chassis. The B+ power supply must be necessarily checked to insure the correct high voltage.

1. Connect an accurate high voltage meter to the second anode of the picture tube.
2. Turn on the receiver. Set the BRIGHTNESS and CONTRAST Controls to minimum (zero beam current).
3. High voltage should be measured less than 27.0 kV.
4. Rotate the BRIGHTNESS Control to both extremes to be sure the high voltage does not exceed the limit of 27.0 kV under any conditions.

4. HORIZONTAL OSCILLATOR ADJUSTMENT

If there is an indication of unstable horizontal sync., adjust the HORIZONTAL HOLD Control (VR401) to remove the condition. Adjust the HORIZONTAL HOLD to the centre of the pull-in range.

5. VERTICAL OSCILLATOR ADJUSTMENT

If the picture moves up or down on the screen, adjust the VERTICAL HOLD Control (VR301) until there is a single image without vertical movement.

6. VERTICAL HEIGHT ADJUSTMENT

HEIGHT Control (VR302) on MAIN Board changes the size of the picture or pattern, having an equal effect on the top and bottom. Make final adjustment to overscan the mask 2 cm at the top and bottom.

7. FOCUS ADJUSTMENT

Adjust FOCUS Control on FBT (T444) for well defined scanning lines in the centre area of the screen.

8. DELAYED R-F AGC ADJUSTMENT

1. Tune the set in the strongest station in your area.
2. Turn AGC-DELAY Control (VR151) on MAIN Board to fully counterclockwise position.
3. Adjust AGC-DELAY Control clockwise until noise (snow) disappears from the screen.

9. AFC (Automatic Frequency Control) FIELD ALIGNMENT

1. Place AFC Switch in OFF position. Tune the set to an active channel and adjust tuning meter for best picture.
2. Place AFC Switch in ON position, and adjust Trans. (T172) on MAIN Board for best picture. Picture quality should be the same as that obtained in above STEP 1.
3. Check the AFC action by turning the fine tuning clockwise and counterclockwise.

10. COLOUR SYNC. ADJUSTMENT

1. Tune in a colour programme and warm up for five minutes.
2. Check the colour appears at the same time as soon as channel is moved to adjacent channel up or down by turns.
3. If not, this is the evidence that APC adjustment is poor.
4. In this case, adjust colour sync. VR (VR508) so that colour appears at the same time by changing the channel or turning the main power switch on and off.

11. COLOUR ADJUSTMENT

1. Tune in the colour programme including the colour bar signals.
2. Set the colour control VR (VR501) to be maximum.
3. Set the DL-PHASE control (VR507) to be proper colour display.
4. If the colour adjustment is incorrect, a Venetian Blind Effect will appear in the colour bars. This case needs adjustment.
5. Adjust Burst Clean coil (L503) and DL-Matching Coil (L504) to be minimum Venetian Blind Effect.

12. COLOUR PURITY ADJUSTMENT

Note: Before attempting any purity adjustments, the receiver should be operated for at least 25 minutes. Purity adjustment requires Rubber Wedge kit.

1. Demagnetize the picture tube and cabinet using a degaussing coil.
2. Turn the CONTRAST and BRIGHTNESS Controls to maximum.
3. Adjust RED and BLUE CUT OFF controls (VR504 and VR502) to provide only a green raster. Advance the GREEN CUT OFF Control (VR503) if necessary.
4. Loosen the clamp screw holding the yoke, and slide the yoke backward or forward to provide vertical green belt (zone) in the picture screen.
5. Remove the Rubber Wedges.
6. Rotate and spread the tabs of the purity magnet (See figure 3) around the neck of the picture tube until a green belt is obtained in the centre of the screen. And at the same time, centre the raster vertically by adjusting the magnet.
7. Move the yoke slowly forward or backward until a uniform red screen is obtained. Tighten the clamp screw.
8. Check the purity of the green and blue raster by adjusting the CUT OFF Controls.
9. Tighten the clamp screw of the yoke temporarily.
10. Obtain a white raster; referring to "CRT WHITE BALANCE ADJUSTMENT."
11. Proceed with convergence adjustment.

13. CRT WHITE BALANCE ADJUSTMENT

1. Tune in an active channel.
2. Set the COLOUR Control to minimum.
3. Turn the SCREEN Control (on FBT T444) fully counterclockwise.
4. Set the RED, and GREEN and BLUE Controls (VR504, VR503, VR502), to the mid position.
5. Set the RED and GREEN DRIVE Controls (VR505, VR506) to the mid position.
6. Set Service Switch (SW201) to "V" position to be one horizontal line.
7. Rotate the SCREEN Control on FBT (T444) gradually clockwise until the second horizontal colour line following the first line appears slightly on the screen. Then turn fully counterclockwise the two CUT OFF Controls corresponding to the colours of the first and the second horizontal lines to eliminate the lines.
8. Set the SCREEN Control to the position where the third horizontal line lights slightly on the screen.
9. Adjust the two CUT OFF Controls set to the minimum in item 7 above to obtain the slightly lighted horizontal line in the same levels of three (red, green, blue) colours. (The line will be white if the CUT OFF Controls are adjusted properly.)
10. Reset Service Switch (SW201) "NOR" position to display normal picture.

11. Rotate the BRIGHTNESS and CONTRAST Controls to the maximum.
12. Adjust the BLUE and GREEN DRIVE Controls to obtain proper white-balanced picture in high light areas.
13. Rotate the BRIGHTNESS and CONTRAST Controls to obtain dark grey raster. Then check the white balance in low brightness. If the white balance is not correct retouch the CUT OFF Controls and DRIVE Controls to obtain a good white balance in both low and high light areas.

14. SUB-BRIGHTNESS ADJUSTMENT

1. Tune in a colour bar pattern.
2. Set the Contrast and Colour Control to minimum position, Brightness maximum.
3. Set the SUB-BRIGHT Control (VR203) to the centre and leave the receiver for five minutes in this state.
4. Connect the digital volt-meter or high impedance volt-meter to pin Z(+) and Y(-).
5. Adjust the VR 203 to 0.25 V.

15. CONVERGENCE ADJUSTMENTS

Note: Before attempting any convergence adjustments, the receiver should be operated for at least 15 minutes.

Centre Convergence Adjustment

1. Receive crosshatch pattern with a colour bar signal generator.
2. Adjust the BRIGHTNESS and CONTRAST Controls for a well defined pattern.
3. Adjust the two tabs of the 4-Pole Magnets to change the angle between them (See figure 3) and superimpose red and blue vertical lines in the centre area of the picture screen. (See figure 3).
4. Turn the both tabs while at the same time keeping angle constant and superimpose red and blue horizontal lines at the centre of the screen. (See figure 4).
5. Adjust two tabs of 6-Pole Magnets to superimpose red/blue line and green one. Adjusting the angle affects the vertical lines and rotating both magnets affects the horizontal lines.
6. Due to interaction between these adjustments steps 3, 4 and 5 should be repeated until satisfactory results are obtained.

Circumference Convergence Adjustment

1. Loosen the clamping screw of deflection yoke to allow the yoke to tilt.
2. Put a wedge as shown in figure 2 temporarily. (Do not remove cover paper on adhesive part of the wedge.
3. Tilt front of the deflection yoke up or down to obtain better convergence in circumference. (See figure 4) Push the mounted wedge into the space between picture tube and the yoke to fix the yoke temporarily.
4. Put other wedge into bottom space and remove the cover paper to stick.
5. Tilt front of the yoke right or left to obtain better convergence in circumference. (See figure 2).
6. Keep the yoke position and put another wedge in either upper space. Remove cover paper and stick the wedge on picture tube to fix the yoke.
7. Detach the temporarily mounted wedge and put it in another upper space. Stick it one picture tube to fix the yoke.
8. After fixing three-wedges, recheck overall convergence. Tighten the screw firmly to fix the yoke and check the yoke is firm.
9. Stick 3 adhesive tapes on wedges as shown in figure 2.

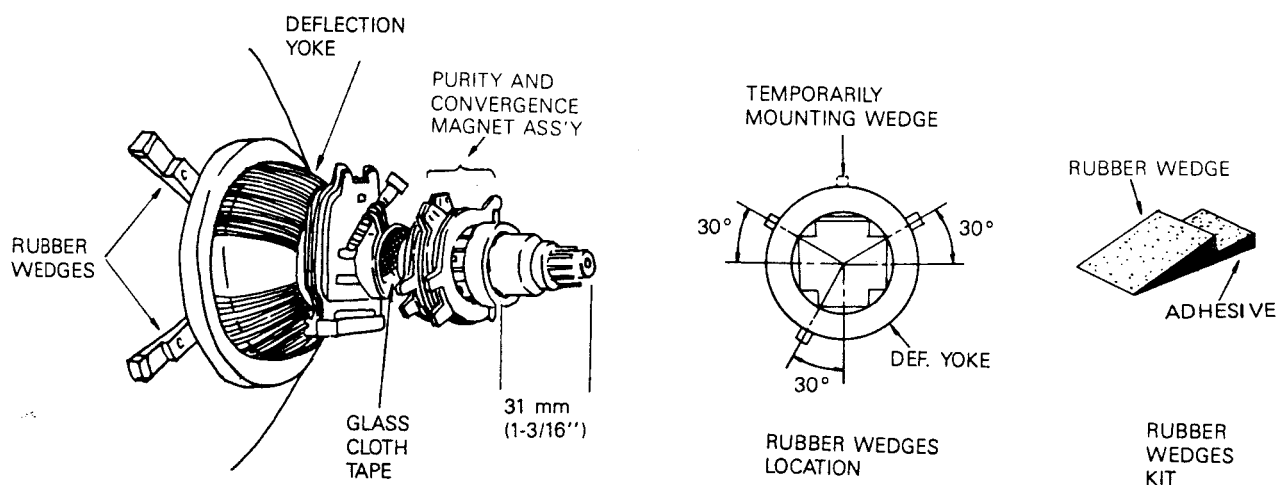


Figure 2.

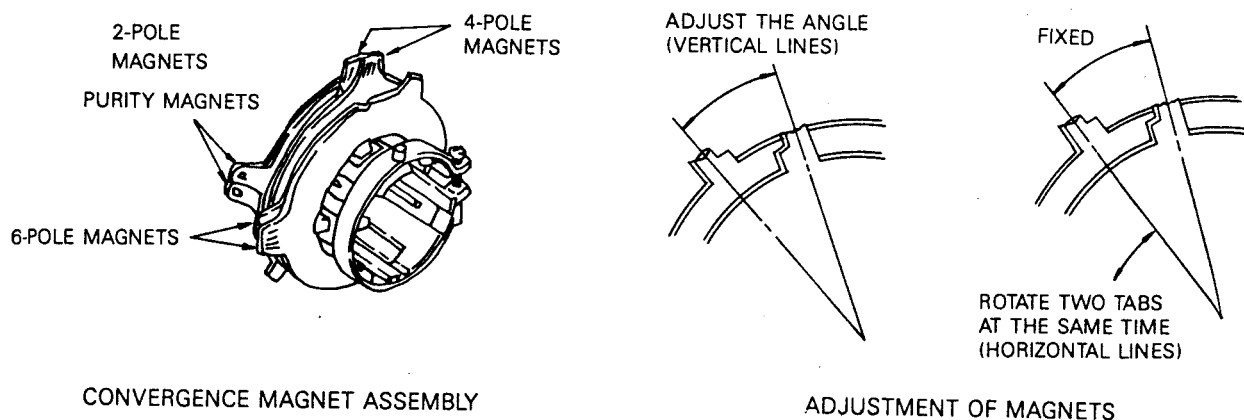
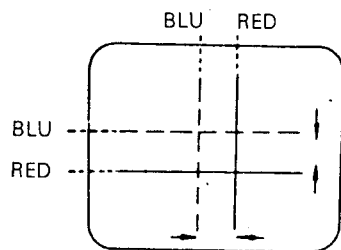
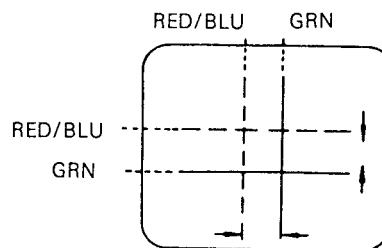


Figure 3.

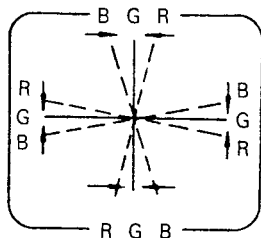


4-POLE MAGNETS MOVEMENT

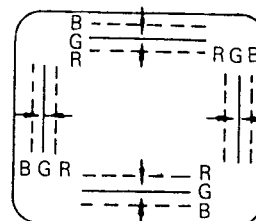


6-POLE MAGNETS MOVEMENT

Centre Convergence by Convergence Magnets



INCLINE THE YOKE UP (OR DOWN)



INCLINE THE YOKE RIGHT (OR LEFT)

Circumference Convergence by DEF. Yoke

Figure 4. Dot Movement Pattern

GENERAL ALIGNMENT INSTRUCTIONS

A. GENERAL

Alignment is an exacting procedure and should be undertaken only when necessary.

The test equipment specified or its equivalent is required to properly perform the alignment procedures which are outlined on the following pages. Use of equipment which does not meet these requirements may result in the inability to properly align the receiver.

It is essential that bias values as specified are maintained during alignment to insure proper results.

B. EQUIPMENT TERMINATIONS

Alignment pads are designed for correct matching of the equipment to the circuits involved. Failure to the proper matching will result in responses which cannot be depended upon as representing the true operation of the receiver. The pads should be constructed as compactly as possible with all unshielded leads not being in excess of 2.5 cm long.

C. SIGNAL OVERLOAD

Use of excessive signal from the sweep generator can cause overloading of receiver circuits. To determine that this condition is not present and that the response curve is true, turn the sweep generator output to zero and then gradually increase the output until a response is obtained. Further increase of the sweep output should not change the configuration of the response except in amplitude. If the response

changes in configuration, e.g. flattening at the top or dropping below the base line at the bottom, decrease the sweep output to restore the proper configuration. The oscilloscope gain should be as high as possible to maintain a useable pattern with the peak-to-peak values specified, thus requiring a lower output from the sweep generator and less chance of overload.

Insertion of makers from the marker generator should not cause distortion of the response.

D. TEST EQUIPMENTS

OSCILLOSCOPE (WIDE BAND)
COLOUR-BAR/DOT/CROSSHATCH GENERATOR
TV SWEEP MARKER ALIGNMENT GENERATOR
VACUUM TUBE VOLTMETER
VIDEO DETECTOR BLOCK
VOLT-OHM MILLIAMMETER
MARKER GENERATOR
AGC BIAS SUPPLY
DIRECT LOW CAPACITY PROBE
SOUND SIGNAL GENERATOR
VIDEO SWEEP GENERATOR
MATCHING PAD
DEGAUSSING COIL — Demagnetized picture tube and chassis.
MICROSCOPE — Microscope of approximately 12 power for phosphor dot observation in the colour picture tube.

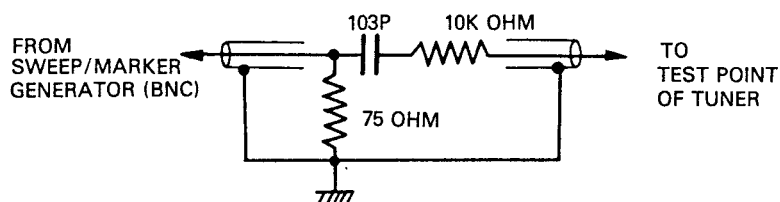


Figure 6. MATCHING PAD

I-F TABLE

System Position	B/G
C	34.47
P	38.9

(Units: MHz)

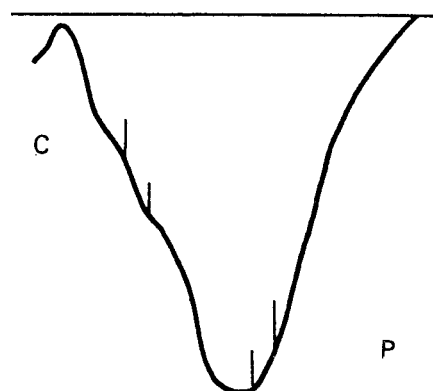


Figure 7. Magnified Response Curve

STEP	SWE/MAR GENERATOR	ADJUST	REMARKS
Magnified Response	Increase (or decrease) the output to obtain a 1.0 V p-p response curve on the scope	T171	Adjust the video detector coil (T171) for maximum display at IF- Table on the scope (Fig. 7)

2. OVERALL RESPONSE ALIGNMENT

GENERAL

PRELIMINARY STEPS

Refer to figures 8 and 9 for test equipment connection and alignment point.

1. Connect the horizontal output of sweep/marker generator to the horizontal input of monitor scope.
2. Set the monitor scope gain for 0.1 V/Cm.
3. Connect the output of sweep/marker generator in series with matching pad to test point on the tuner through 10K ohm resistor. (Fig. 6).
4. Connect the monitor scope with direct probe to TP-11 on main board.
5. Connect the damping resistor (100 ohm) between T1 and T2 (pin 19, 20 of IC 101) on main board.
6. Apply +16.5 Volts bias to TP-16 on main board.
7. Apply +4.2 Volts bias to TP-14 on main board.
8. Gradually increase (or decrease) the output of sweep/marker generator to obtain a 1.0 Vp-p response curve on the scope.

1. MAGNIFIED RESPONSE ALIGNMENT

GENERAL
PRELIMINARY STEPS

Refer to figure 5 and 7 for test equipment connection and alignment points.

1. Connect the horizontal output of sweep/marker generator to the horizontal input of monitor scope.
2. Set the monitor scope gain for 0.1 V/Cm.
3. Connect the output of sweep/marker generator in series with matching pad to Test Point on the tuner through 10K ohm resistor. (Fig. 6).
4. Connect the monitor scope with direct probe to terminal TP-11 on main board.
5. Apply +16.5 volts bias to TP-16 on main board.
6. Apply +4.2 volts bias to TP-14 on main board.
7. Gradually increase (or decrease) the output of sweep/marker generator to obtain a 1.0 Vp-p response curve on the scope.
8. If necessary, adjust sweep center and sweep width control for proper location curve on the scope.

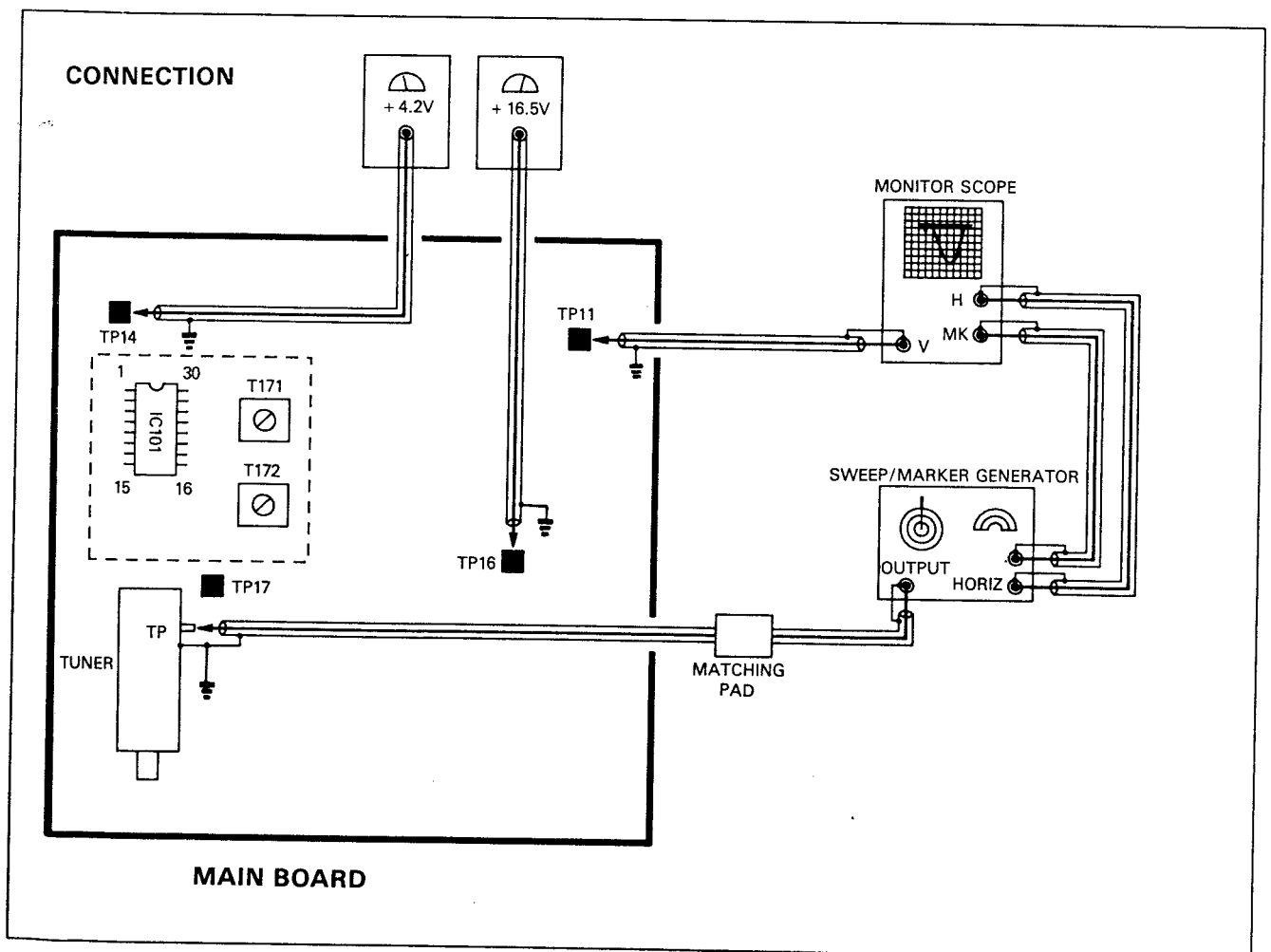


Figure 5. Magnified Response Alignment

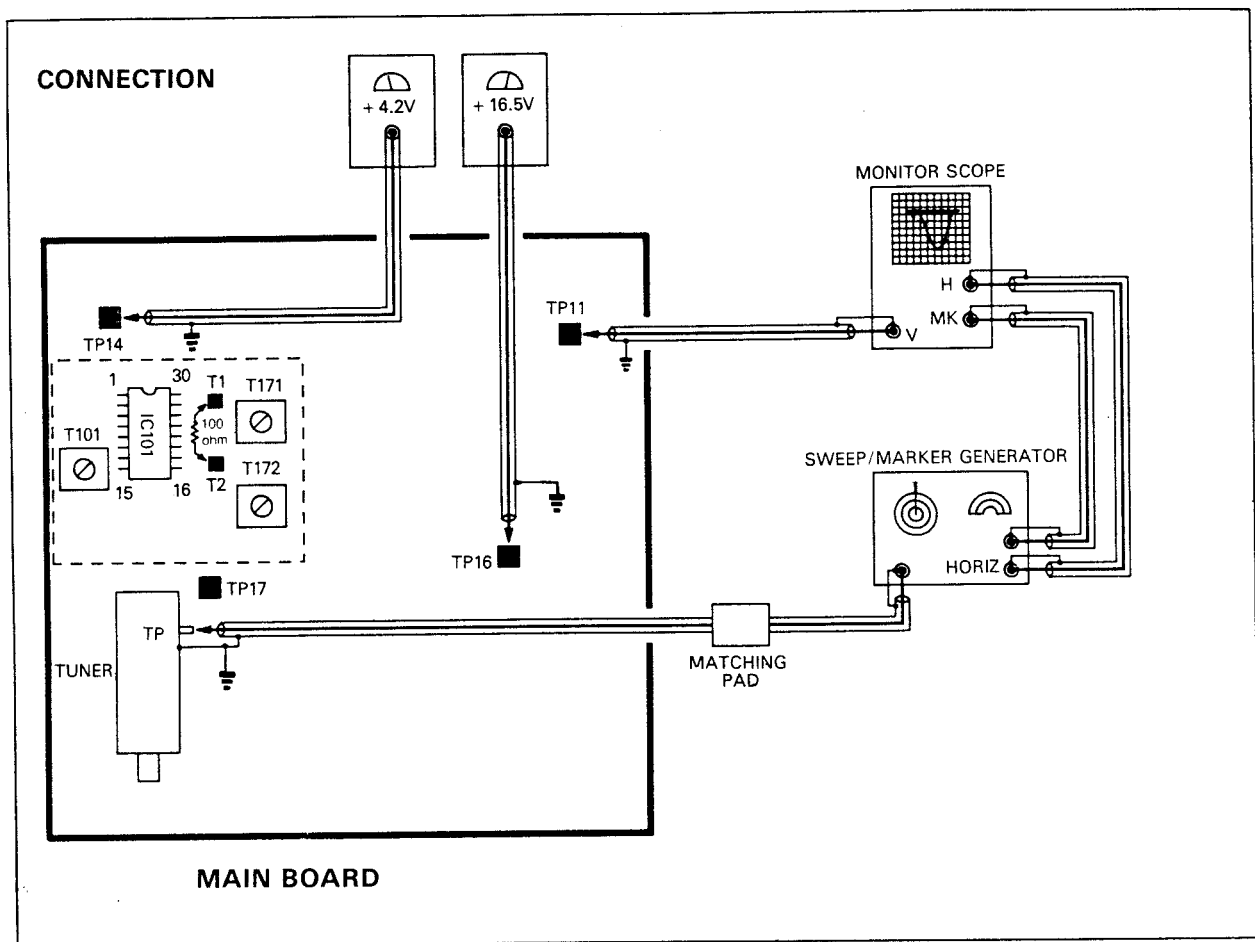


Figure 8. Overall Response Alignment

System Position	B/G
A	31.9
S	33.4
C	34.47
D	35.05
E	38.15
P	38.9
G	40.4

(Units: MHZ)

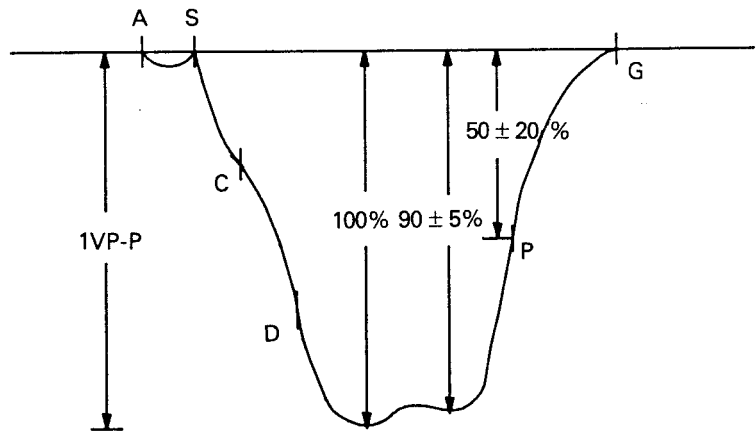


Figure 9. Overall Response Curve

STEP	SWE/MAR GENERATOR	ADJUST	REMARKS
OVERALL	Set the output of SWE/MAR generator to obtain a 1.0 V p-p response curve on scope.	(1) T101 (2) Converter core of the tuner	Alternately adjust T101 and converter core on the tuner for response shown in Figure 9

3. AFC ALIGNMENT

PRELIMINARY STEPS

1. Unplug CN01 connector from main board.
2. Apply + 4.2 Volts bias to terminal TP-14 on main board.
3. Apply + 16.5 Volts bias to TP-16 on main board.

STEPS

1. Connect the output of sweep/marker generator in series with matching pad to test point on the tuner (Refer to Fig. 6).
2. Connect the monitor scope with direct probe to TP-17 on main board.
3. Set the monitor scope gain for 0.2 V/Cm.
4. Gradually increase (or decrease) the A.G.C. bias to obtain 2 Vp-p response on the scope.
5. Adjust T172 for response shown in Figure 10 to be minimum amplitude of VIF keying pulse.

System Position	B/G
PIF	38.9

(Units: MHz)

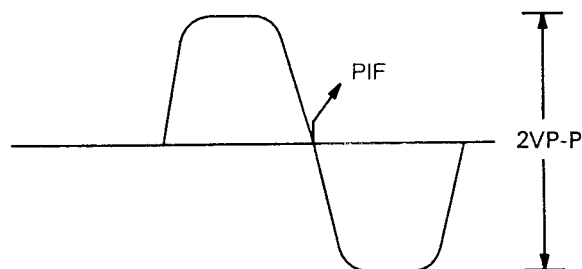


Figure 10. AFC Response Alignment

4. COLOUR SYNC ADJUSTMENT

PREPARATION

1. Connect A.C. line and switch the A.C. power to "ON".
2. Receive colour bar pattern with colour bar generator.
3. Connect terminal TP-43 to chassis ground with a short jumper wire.
4. Connect the 12th pin (TP-CZ) of IC501 to TP-12V through 10K ohm resistor so that the colour killer turns off.

STEPS

1. Adjust APC control (VR508) so that the colour bar pattern stands still vertically.
2. Remove the short jumper wire and 10K ohm resistor.
3. Check that the colour appears within 0.5 sec. when changing the channel to another.

5. COLOUR MATRIX ADJUSTMENT

PREPARATION

1. Set the power switch in "ON" position.
2. Receive colour bar pattern with colour bar pattern generator.
3. Set the contrast (VR202), Brightness (VR201) and colour (VR501) controls to maximum position.
4. Connect the synchroscope probe to TP-51.

STEPS (Method 1)

1. Adjust the L503 (Burst clean) so that part (a) and part (d) (Blanking level) are on the same level.
2. Adjust the VR507 (DL phase control) and the L504 (DL matching coil) so that part (b), part (c) and part (d) are on the same level.
3. If Venetian Blind Effect appear after this adjustment repeat above STEP 1, and 2.

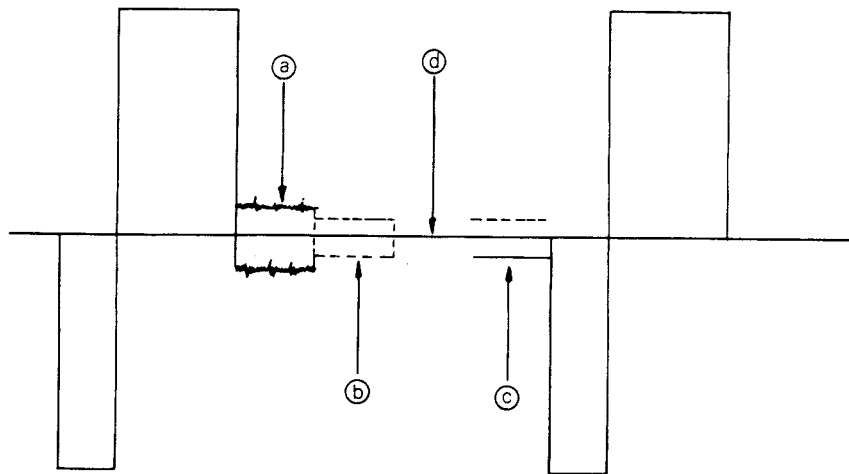


Figure 11-1

STEPS (Method 2)

1. Receive colour bar pattern
2. Connect the synchroscope to the TP-51 on the main board.
3. Adjust L503 so that the non-colour part and horizontal blanking part are on the same level.
4. Adjust VR507 so that the non-colour part and the (B-Y) 0/180° part are on the same level.
5. Adjust L504 so that each difference on the respective peak become to be minimum.
6. If venetian blind appears after these adjustments repeat above step 3.4 and 5.

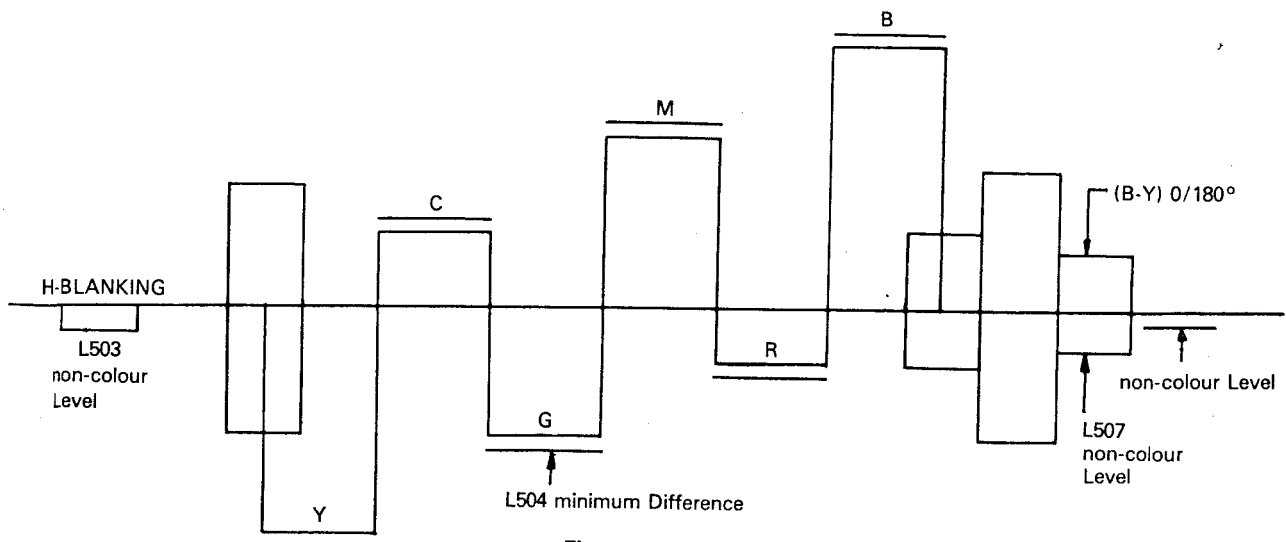


Figure 11-2

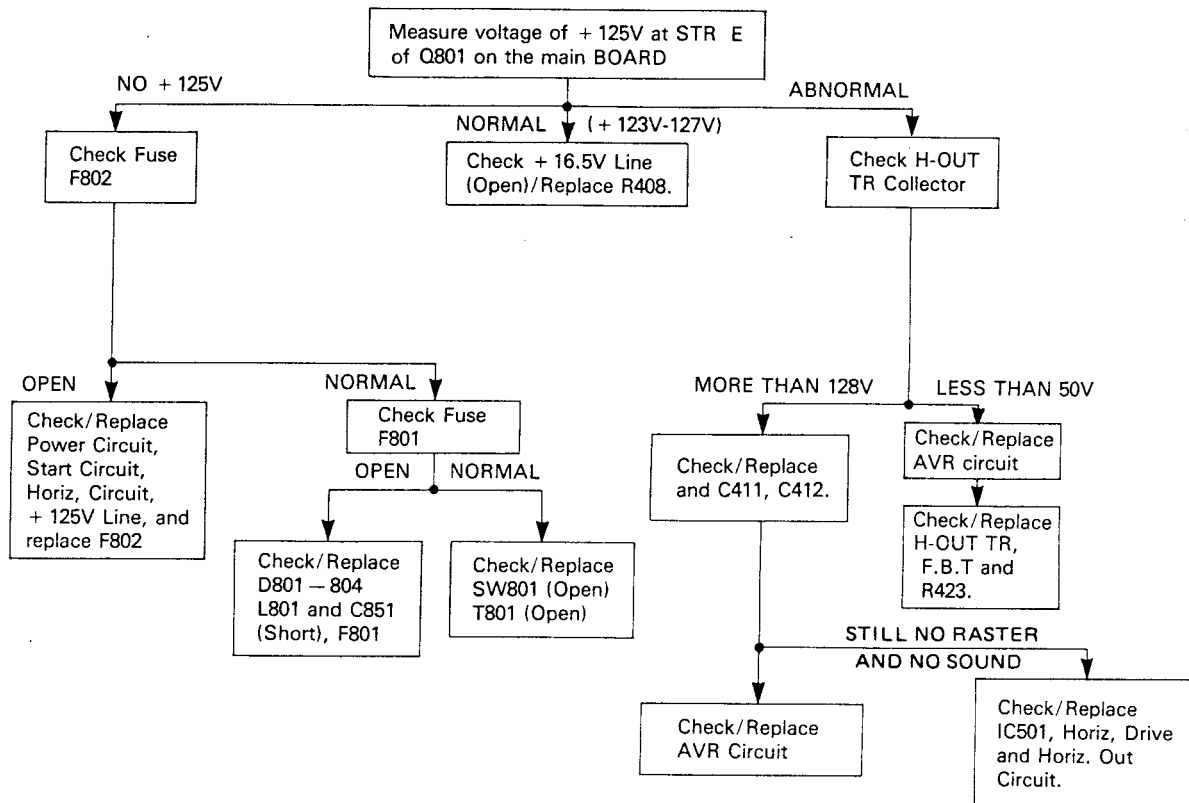
TROUBLESHOOTING CHARTS

The following charts are devoted to troubleshooting which, if followed carefully, will assist you in tracking down a fault to the correct stage.

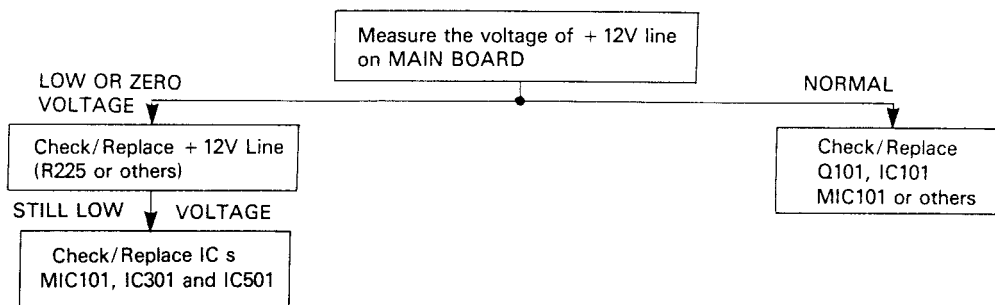
In order to utilize the charts (fault trees), first establish the complaint, i.e. — No Raster, No Sound.

Locate the chart applicable and then progress through the various alternatives until a final block indicates the offending components or stage.

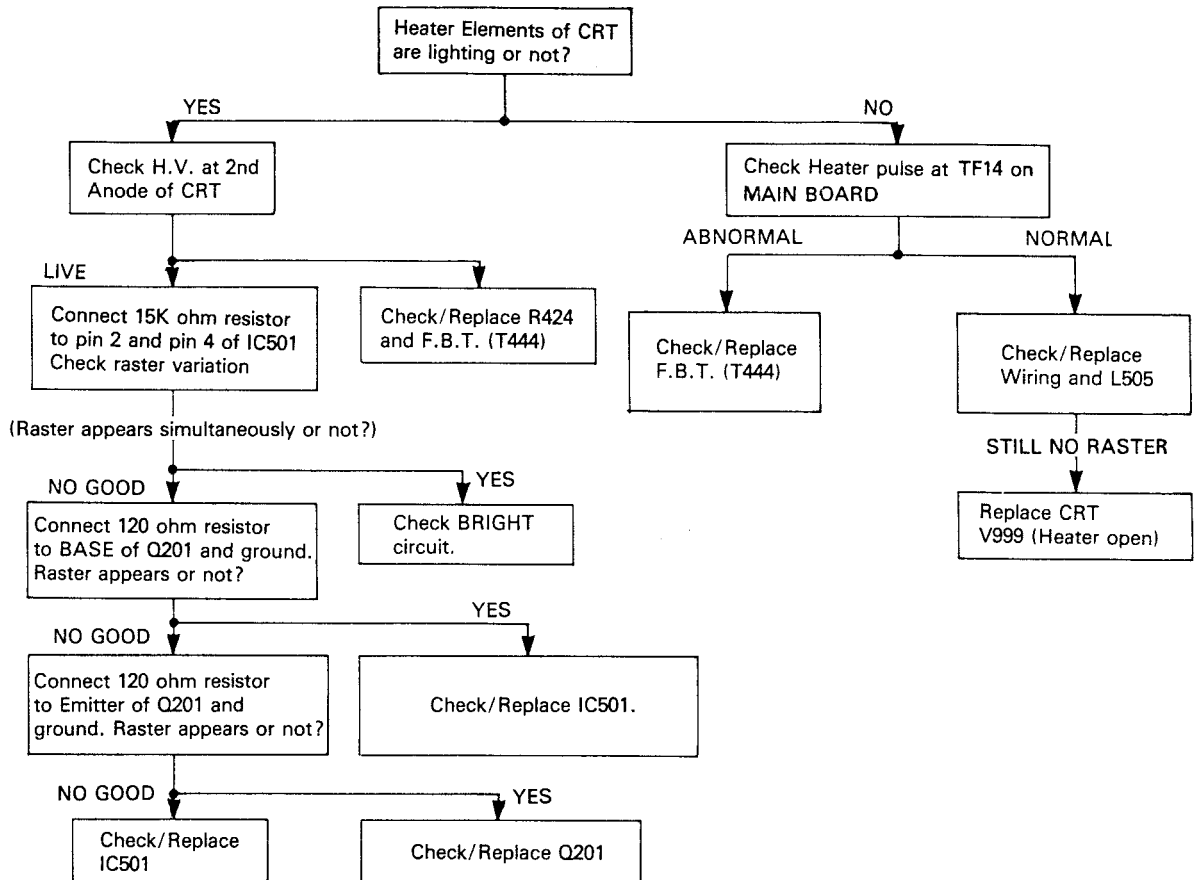
NO RASTER AND NO SOUND



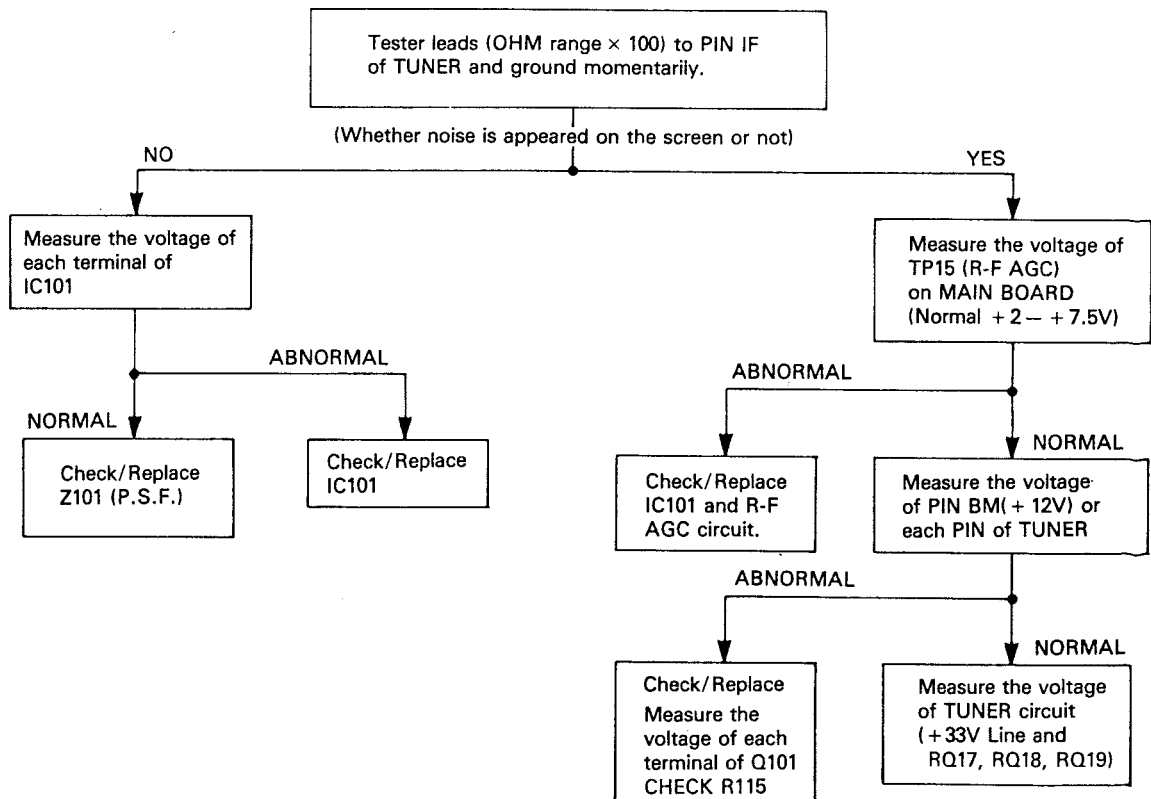
NO RASTER (NOSOUND OR WEAK SOUND)



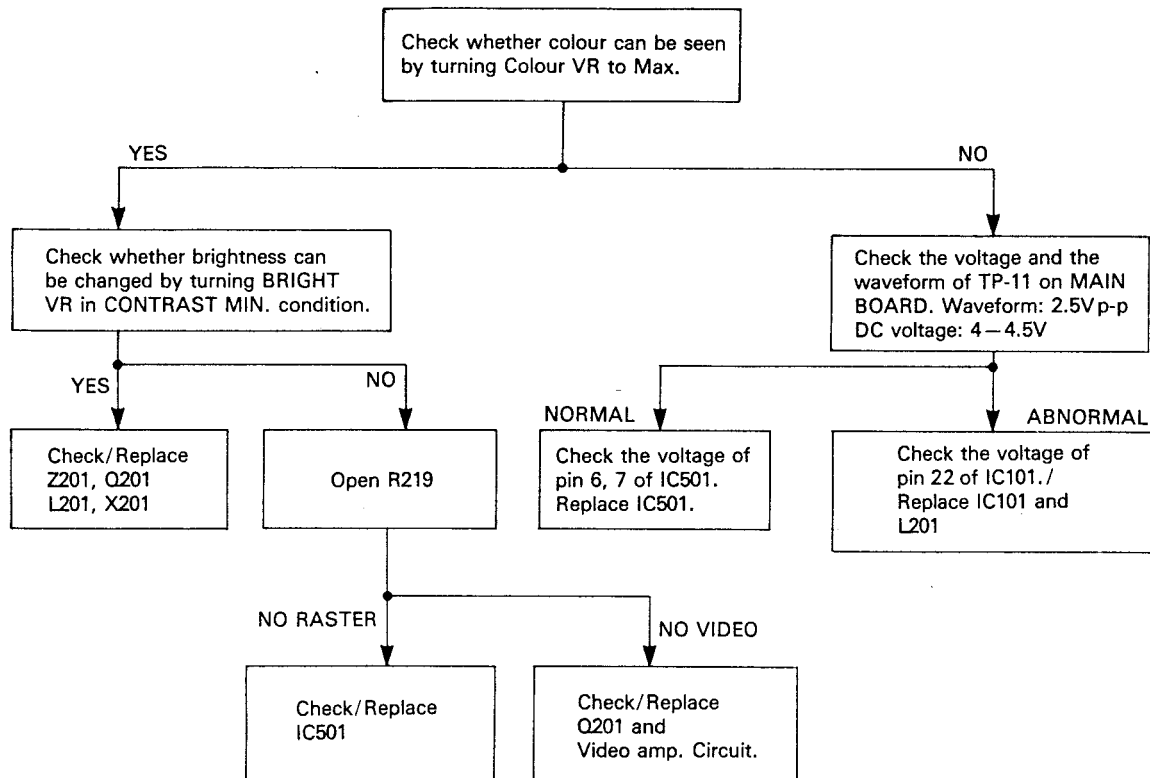
NO RASTER (SOUND OK)



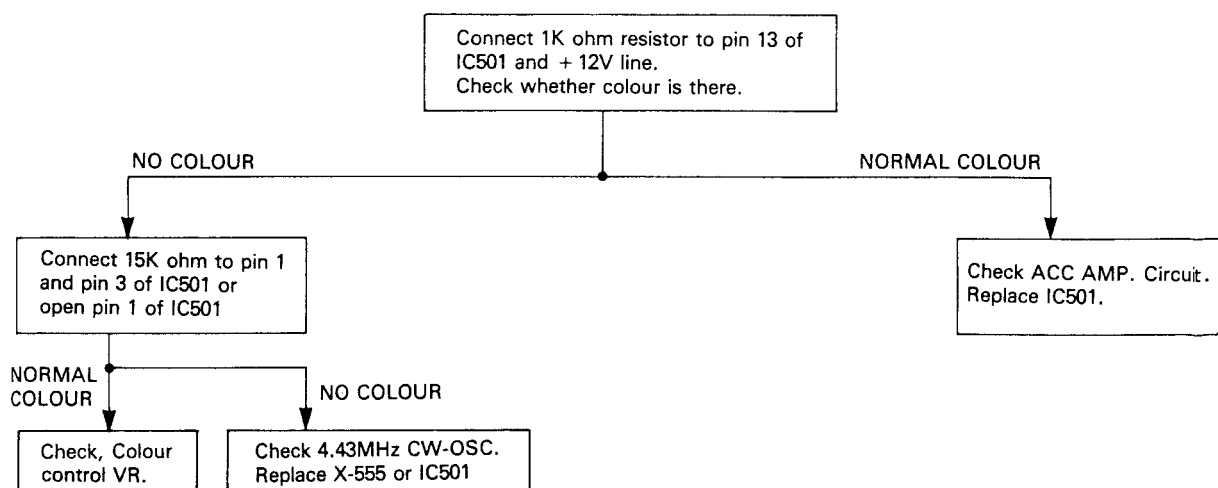
NO PICTURE (RASTER ON) AND NO SOUND



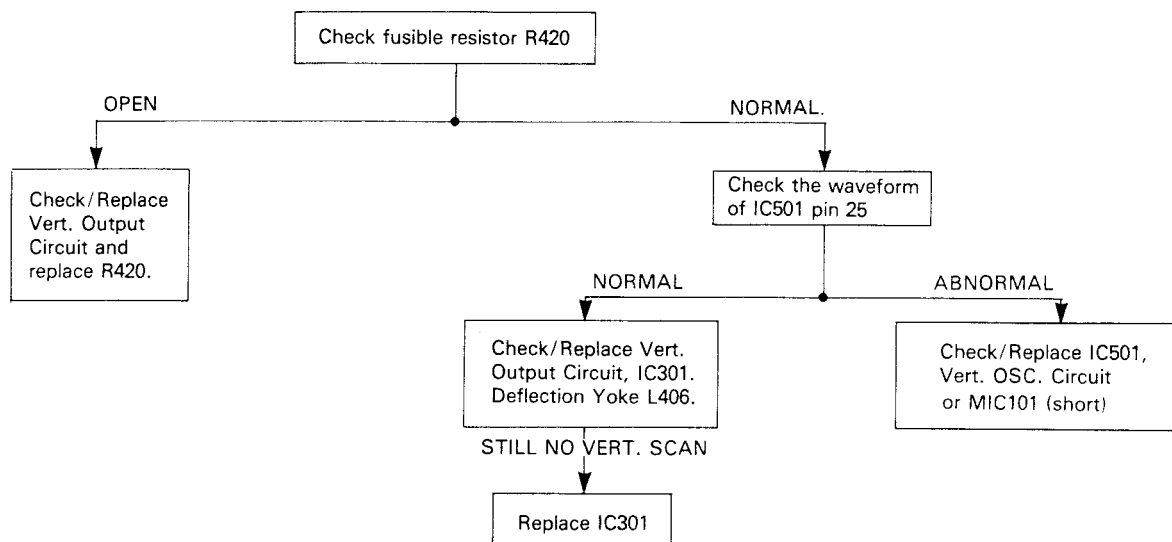
NO PICTURE (RASTER AND SOUND OK OR NOSOUND)



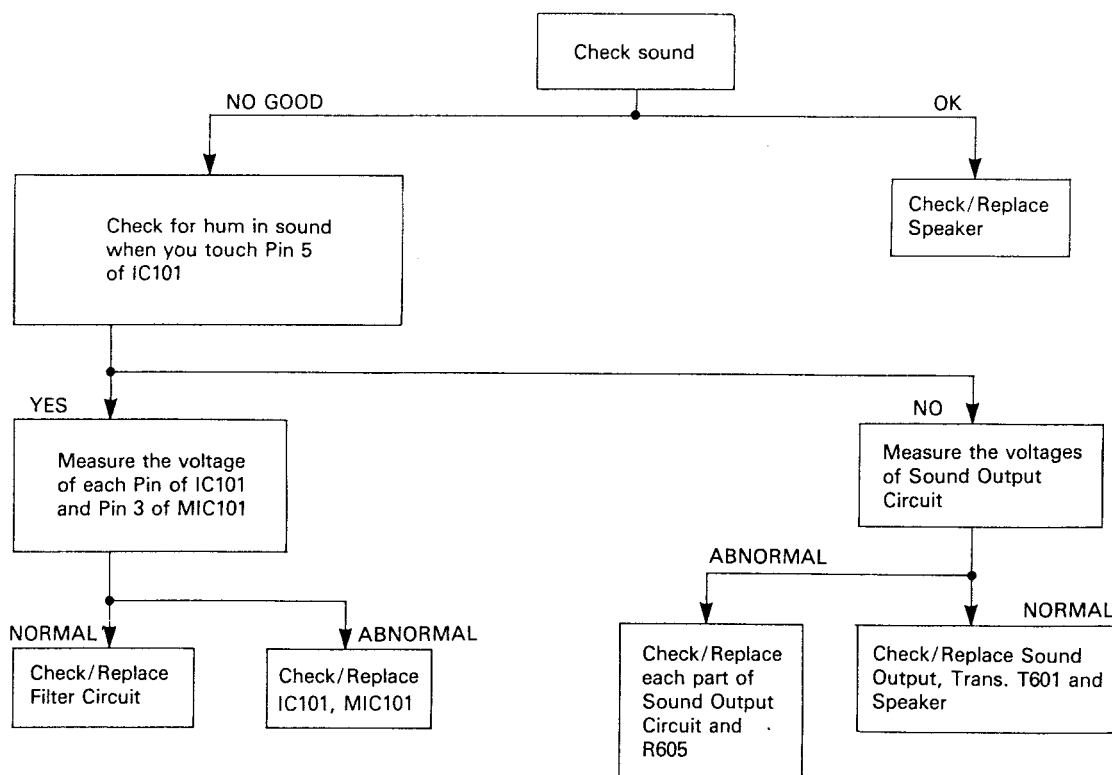
NO COLOUR



NO VERT. SCAN (ONE HORIZ. LINE RASTER)



NO SOUND



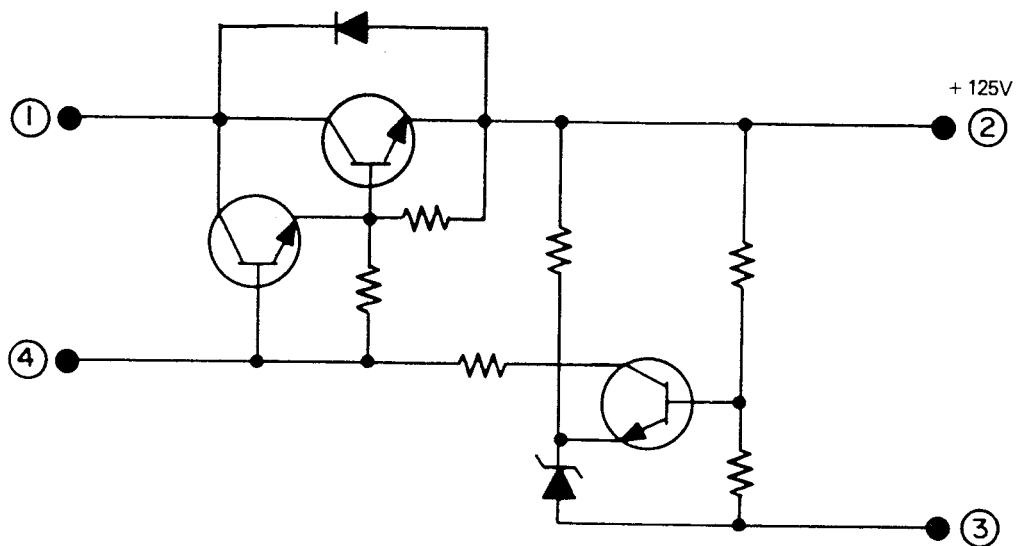
HYBRID IC SPECIFICATION

STR 3125

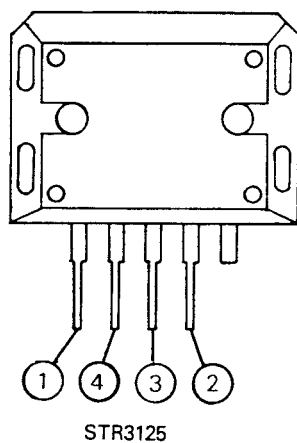
1. STRUCTURE & APPLICATION

- Hybrid type voltage regulator by darlington transistor.
- For line operated TV.
- Output voltage steady.

2. EQUIVALENT CIRCUIT



3. PIN ASSIGNMENT (BOTTOM VIEW)



STR3125

PIN NO.	FUNCTION
1	INPUT (C)
2	OUTPUT (E)
3	COMMON (-)
4	BASE (B)

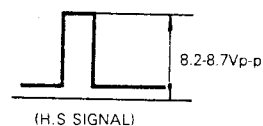
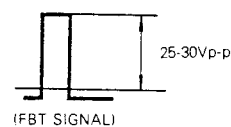
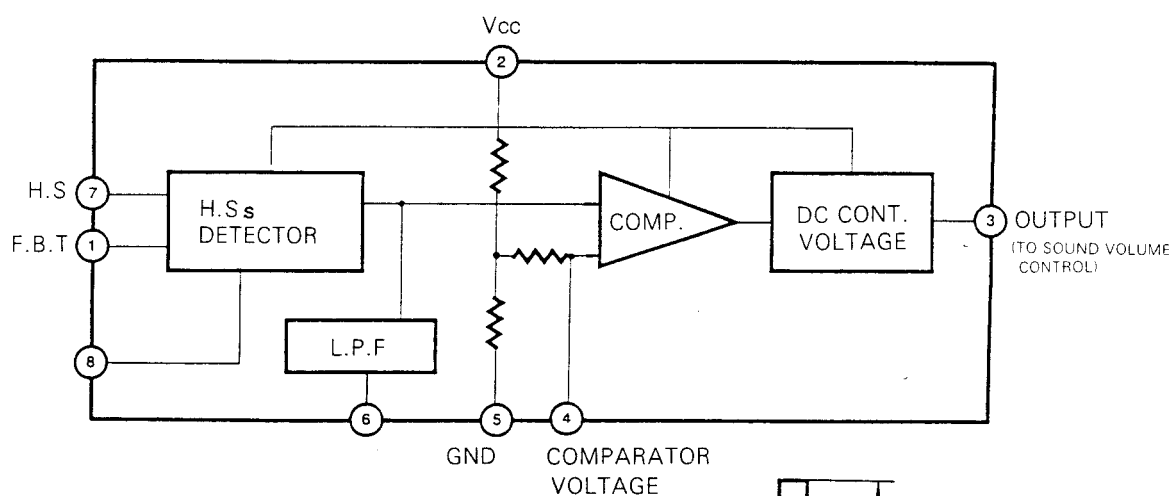
SOUND MUTE IC SPECIFICATION

KA 2103L

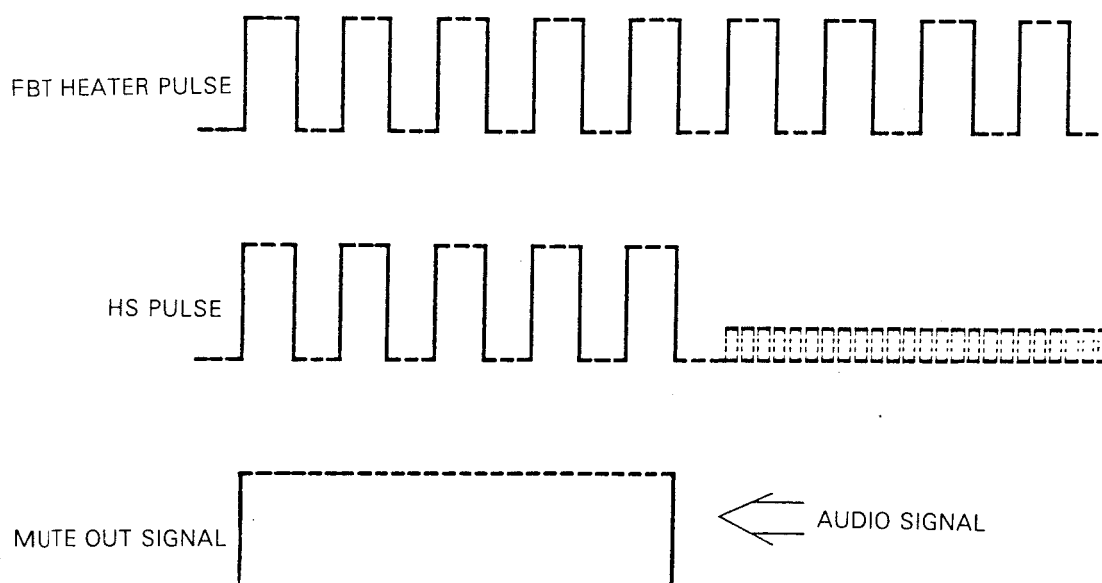
1. FEATURES

- Wide operating voltage range.
- Small shock noise at the time of power on/off.
- Good noise sound muting characteristic.
- Capable of being connected to the other IC directed.
- Collector open output.
- Minimum number of external parts required.

2. BLOCK DIAGRAM



3. WAVE FORM (active state)



REMOCON FEATURES

1. PROGRAMMING METHOD

1) The M491 contains the following to provide a complete digital TV tuning system by voltage synthesis on single chip non volatile station memory, PCM remote control receiver and display driver.

- M491 16 station memory — 7 segment LED display
- Voltage Synthesizer: 13 bits
- 4 Band preset capability
- Non volatile memory: 304 bits
 - 16 Words of 19 bits for tuning voltage (13 bits) Band (2 bits) — Fine detuning (4 bits)
 - 10^4 Modify cycles per word
 - Min 10 years data retention
- PCM Remote control receiver: Decodes signal transmitted by M708

- Volume D/A: 6 bit resolution/8KHz
- Memory skip function
- Automatic search with digital AFT control
- Fine detuning D/A acting on AFT discriminator (16 steps) with separate storage for each memory position. Alternatively it can be used to control brightness or colour saturation.
- Manual search with digital AFT control
- Manual search with linear AFT
- Sweep search display output
- Supply voltages: $V_{DD} = +5V$
 $V_{PP} = +25V$ for the memory
- Clock oscillator: 455 to 510KHz
- Integrated digital power on reset (No external initialization circuitry required)

2. REMOTE CONTROL OPERATION

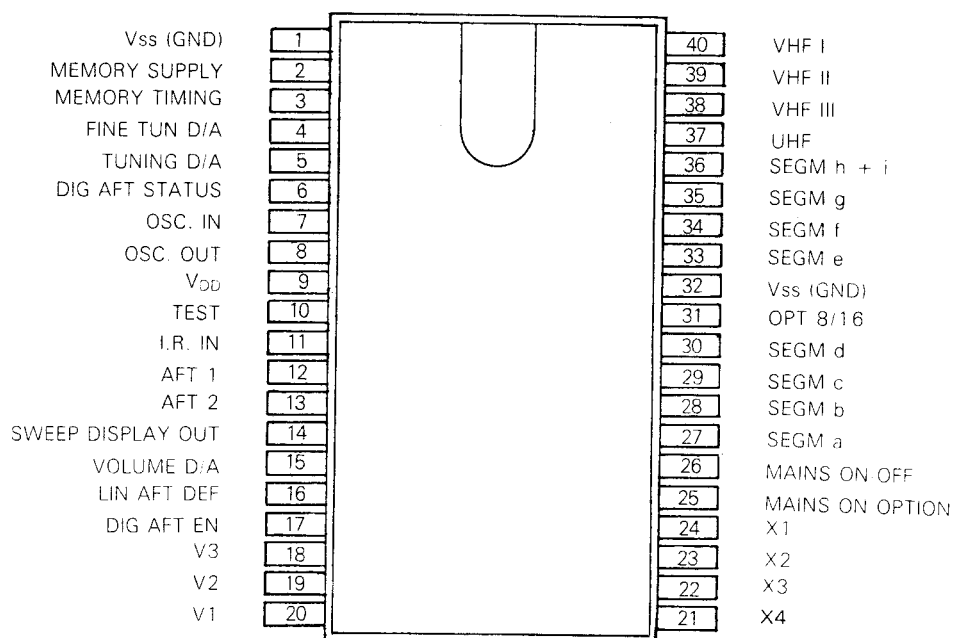


Figure Pin Assignment of M491

1. Memory Supply Voltage

A supply voltage of $25 \pm 1V$ has to be applied to this pin during the modify and read cycles.

2. Modify, Write, Erase, Read Cycle

- Modify Cycle

Modify cycle consists of three steps:

a. All '1's are written in the bits of the selected word.

b. All bits of the selected word are erased. (all '0's)

c. The new content is written.

In this way a constant aging of all the bits of the is obtained.

During both write and erase cycles the memory situation is checked continuously; therefore after each write or erase pulse a read operation is carried out. The write or the erase operations are stopped as soon as the result of the read operation is valid.

- Write Cycle

The peak of the current flowing through pin 2 during a write operation is shown in Fig. 3, while Fig. 4 shows the envelope of the same current.

The typical write time is 3-4 ms for the first cycles and increases to about 30 ms after 1000 cycles.

Figure 3

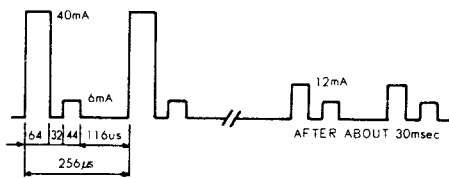
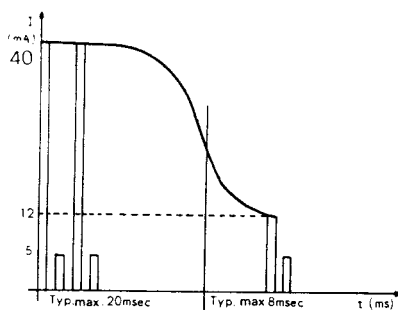


Figure 4



- Erase Cycle

Fig. 5 shows the timing and the waveform of the current flowing through pin 2 during the erase operation. The peak current is 7 mA (max) during the erase cycle and 6 mA (max) during the read cycle. The typical erase time is 10 ms for a new device and it increases with the number of modify operations up to 200 ms after 1000 cycles.

In order to protect the memory in case of failure of some bits the modify operation is stopped after 1 sec.

- Read Cycle

Fig. 6 shows the waveform of the current during a read operation.

Figure 5

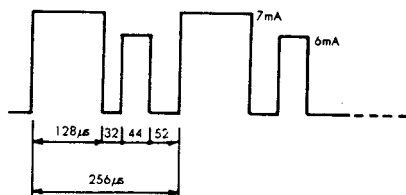
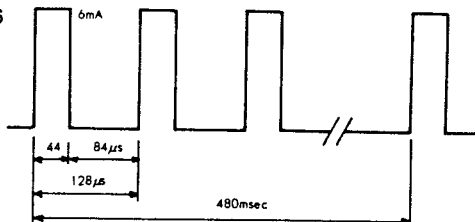


Figure 6



3. Memory Timing Output

This output gives the timing for the pulses to be applied at pin 2 during the modify and read cycles. The output consists of an open drain transistor.

4. Tuning D/A

$A2^{13} = 8192$ step pulse modulated signal for the tuning voltage is available on this pin. Pulse modulation is implemented by combination of a rate multiplier and pulse width principle.

With a tuning voltage increasing from zero, the number of pulses increases continuously up to $2^8 = 256$; starting from this point the number of pulses remains the same but the pulses get large until they reach the maximum content of the internal counter. The output consists of an open drain transistor which offers a low impedance to ground when in the ON state.

5. Oscillator Input/Output

The frequency of the clock oscillator should be between 445 and 510kHz using a cheap ceramic resonator. In these conditions the value of the reference frequency of the transmitter can be in the same range. In other words the transmitter and the receiver can operate with different reference frequencies.

6. V_{DD}

The supply voltage has to be comprised in the range 4.75 to 5.25V. When it is applied an internal power on reset of 0.5s is generated.

The memory position 1 is automatically read if the mains on option input (pin 25) is grounded.

7. Test

This pin is used for testing and has to be connected to V_{SS} .

8. I.R. Signal Input

The integrated receiver decodes signals transmitted by M708, address 9.

The minimum signal to be applied is 0.5V peak to peak. (AC coupled).

The receiver input section performs the following tests on the incoming signal to achieve the necessary noise immunity:

- measurement of the pulse distance (time base synchronization)
- check of the position of the received bits opening window at the time bases
- check of the parity bit.
- check of the absence of pulses between the parity bit and the stop-pulse
- check of noise level; the receiver checks parasitic transient inside and outside the time windows.

If the above test conditions are not fulfilled, the received word is rejected and not decoded. If the received signal is acknowledged as a valid word it is stored and decoded.

The end of transmission will be acknowledged by receiving the end of transmission code or by means of an internal

timer if the transmission remains interrupted for more than about 550 ms.

9. AFT1-AFT2 (STOP/AFT Inputs)

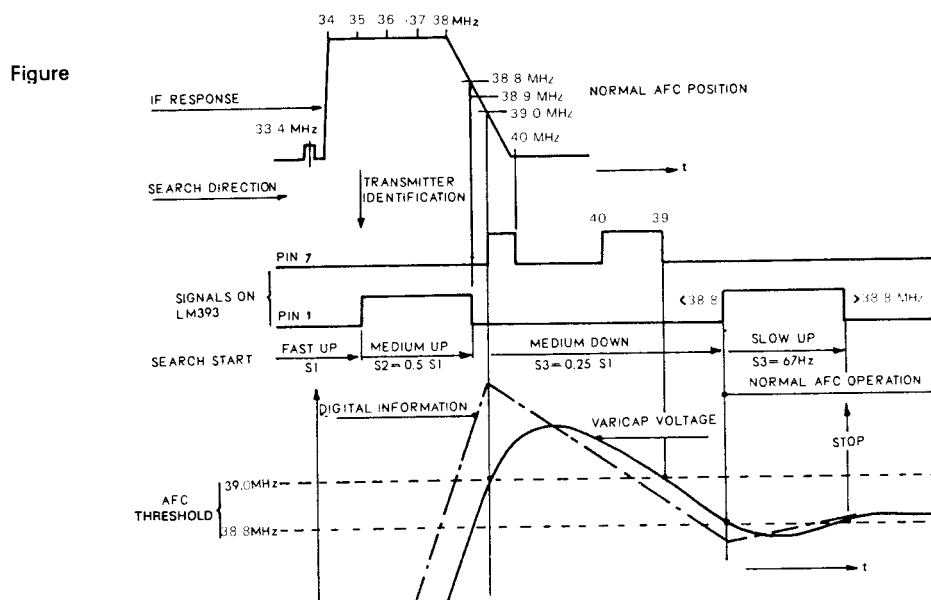
These pins are enabled during the automatic search and during normal operation, when the digital AFT is enabled (see description of pin 17)

The STOP/AFT inputs are also disabled internally during any program or band change for the duration of the Mute signal.

These pins work according to the truth table given below:

M49X pin 12 LM393 pin 7	M49X pin 13 LM393 pin 1	FUNCTION (referred to the tuning voltage)
H	L	UP
L	H	DOWN
L	L	MIDDLE
H	H	NO OPERATION

These inputs have two differentiations depending on whether the system is in the search or in normal operation (AFT control). The inputs have internal pull-up resistors of 30 K Ω typ.



10. Sweep Search Display Output

This output, which is normally Low, goes High during automatic search and automatic present at intervals of 160 ms for about 40 ms to blank the LED of band display.

11. Volume D/A Output

This output delivers a square wave signal of 7.8 kHz and duty cycle variable in 63 steps. In case of duty cycle is changed at the rate of the transmitted signal (approximately every 102 ms with $f_{ref} = 500$ kHz) or every 112 ms if issued locally.

Overflow and underflow protection are provided.

The volume output can be switched to V_{SS} and reset to the previous level by means of the mute on/off command. It is also reset by the volume Up/Down and the mains on/off commands.

The volume is muted at each mains on and off command for about 1's during the power on reset time (0.5 s) and program change.

At the first power on reset of V_{DD1} the volume D/A is set at the level 21/64. The last level is preserved until V_{DD} is not removed.

12. Digital AFT Enable Input

If this input is connected to V_{SS} (GND), the digital AFT loop is always disabled. If pin 17 is left open or is connected to V_{DD} , the digital AFT is automatically enabled at power on. When a manual up/down search command is issued, the digital AFT loop is disabled and the digital AFT status output is switched off.

The digital AFT loop is restored by the commands: Digital AFT on/Automatic search/Automatic preset.

13. Keyboard Matrix

A command is accepted if the corresponding contact has been closed for a minimum time of 30 ms.

Local input commands and I.R. commands have the same priority.

If a complete I.R. command has been received, the local inputs are blocked until the command has been executed and the "end of transmission code" generated.

Viceversa an I.R. signal cannot be decoded until an issued local command has been executed.

14. Mains on Option Input

If connected to V_{ss} (GND) the Mains output is automatically switched on when V_{DD} is applied and memory 1 is read.

If it is connected to V_{DD} the circuit goes in stand by condition

15. Mains ON/OFF Output

Switch on of the set is controlled by the Mains on command issued for more than 0.3 s. The output transistor if set in the off condition to drive through an integrated pull-up resistor an external NPN transistor.

At each Mains on command a memory read out occurs. As V_{DD} supply voltage must reach the value of 25V within 1 second after a Mains on command.

In case of automatic switch on at power on caused by pin 25 at GND, the total delay is of 1.5 second (0.55 s for V_{DD} power on reset plus 1 second for mains on).

The Mains on/off command; if repeated, will switch the output on (set off)

The last address information is preserved until V_{DD} is present.

Next Mains on command will switch the set at the previously selected memory address and a read operation will be performed.

16. Memory Address Input/Output

These pins operate as output only for display of the selected memory location. Max drive capability is of 15mA/1.2V with the exception of pin 36 that is of 30 mA/1.5V.

Direct memory selection is only possible by remote control. A local memory up/down command is available in case of emergency

Pin 32 must be grounded.

If pin 31 is grounded, the memory position 9 to 16 are skipped in case of memory up/down commands. For normal operation pin 31 can be left open or, better, connected to V_{DD} .

17. Band Input/Output

These outputs are provided to select up to 4 bands via external PNP.

If one or more bands have to be skipped, the corresponding outputs have to be short-circuited to V_{ss} .

TROUBLE SHOOTING CHART – REMOTE CONTROL BOARD AND SELECTOR BOARD

SYMPTOM	CHECK POINT	RESULT		CAUSE																							
		OK	NO GOOD																								
• Power relay does not operate	(1) AC voltage between pins S2 of CNP801	AC 13V	0V	• Defect in T801, F801, RD01~04.																							
	(2) Pressing the power button, check the DC voltage of pin (26) of ICS01	2.5V	0V	• Defect or poor soldering of RR50, RQ16, Relay switch (RL01), RR02. • Defect or poor contact of ICS01, CNP801																							
• Voltage chart of selector board	(1) Pin (2) of CN01	125V	0V	• Poor contact of CN01 or defect to +125V line on main board.																							
	(2) Cathode of RD06	12V	Over 14V or below 10V	• Defect in RD06, ICP01, ICS02.																							
	(3) Emitter of RQ02	5V	Below 2V	• Defect in RQ02, RD08, RR04, ICS01																							
	(4) Emitter of RQ12	24V	0V	• Poor contact or defect of CN01, RR12, RR14, RR15, RR16, RQ12, RD09 or +125V line on main board.																							
• Voltage chart of tuner	<table><tr><th rowspan="2">VOLTAGE/ TEST POINT</th><th colspan="3">BAND STATE</th></tr><tr><th>VHF LOW</th><th>VHF HIGH</th><th>UHF</th></tr><tr><td>B +</td><td>12V</td><td>12V</td><td>12V</td></tr><tr><td>BU</td><td>0V</td><td>0V</td><td>12V</td></tr><tr><td>BH</td><td>0V</td><td>12V</td><td>0V</td></tr><tr><td>VL</td><td>12V</td><td>9.5V</td><td>0V</td></tr></table>		VOLTAGE/ TEST POINT	BAND STATE			VHF LOW	VHF HIGH	UHF	B +	12V	12V	12V	BU	0V	0V	12V	BH	0V	12V	0V	VL	12V	9.5V	0V		• Defect in +16.5V line and Q101, D101, R115 of main board, or tuner. • Defect in RQ17, ICS01. • Defect in RQ18, ICS01. • Defect in RQ19, DS03.
VOLTAGE/ TEST POINT	BAND STATE																										
	VHF LOW	VHF HIGH	UHF																								
B +	12V	12V	12V																								
BU	0V	0V	12V																								
BH	0V	12V	0V																								
VL	12V	9.5V	0V																								
• Channels are not displayed	Check CNR03, CNR05, RR67, RR72			• Poor contact or defect of CNR03, CNR05 + 5V lines.																							
• Channels up/down or Volume up/down of Fine up/down doesn't operate	Pressing the channel, volume fine up/down button, check ICS01 (The pin (18)-(20) of ICS01 are keyboard input and the pin (21)-(24) of ICS01 are keyboard input and the pin (21)-(24) of ICS01 are keyboard output.)	5V	0V	• If keyboard input voltage has 5V but it doesn't deliver to keyboard output, defect or poor contact of CNR02 or select control board (PRO/NOR-S/W) • If there is no keyboard input voltage, defect of poor contact of ICS01																							

SYSTEM	CHECK POINT	RESULT		CAUSE
		OK	NO GOOD	
(Channel search or memory doesn't operate)	(Pressing the channel search or memory button, check PRO/NOR-S/W or corresponding pin voltage of ICS01)	5V	0V	
• Remote control doesn't operate	(1) Depressing the transmitter key, check the collector waveform of QT02 or QT03 on Transmitter PCB.	38KHz, 2Vp-p	Below 1.5Vp-p	• Defect in batteries, ICT02 collector voltage is 38KHz 2Vp-p and still remote control doesn't operate, check the step (2).
	(2) Depressing the transmitter key, check pin (11) of ICS01	4.5Vp-p	5Vp-p	• Defect in ICP01, ICS01, or the associated parts.

CHASSIS REPLACEMENT PARTS LIST

CHASSIS NO. P-50

WARNING: BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION," "SAFETY PRECAUTION" AND "PRODUCT SAFETY NOTICE" ON THIS MANUAL.

ABBREVIATIONS:	CC	C-CERAMIC	RC	R-COMPOSITION
	CE	C-ELECTROLYTIC	RD	R-CARBON
	CFS	C-M, POLYESTER	RF	R-FUSIBLE
	CK	C-CERAMIC, HK	RM	R-METAL, FILM
	CQ	C-POLYPROPYLENE, POLYESTER	RP	R-CEMENT WIRE
	CS	C-TANTALUM, SOLID	RS	R-METAL, OXIDE

Schematic Location	Supplier Part No.	Description
MAIN BOARD (common)		
RESISTORS		
R106, R215 } R220, R226 } R311, R324 } R505, R610 } R602, }	1018-277-1021	RD 1/4T 1K-J
R214, R303 } R100 }	1018-277-1030	RD 1/4T 10K-J
R203, R604	1018-277-1012	RD 1/4T 100-J
R216, R403	1018-277-1049	RD 1/4T 100K-J
R429, R531		
R513, R518	1018-277-1216	RD 1/4T 120-J
R525	1018-277-1225	RD 1/4T 1.2K-J
R210, R519	1018-277-1234	RD 1/4T 12K-J
R416	1018-277-1331	RD 1/4T 13K-J
R103, R108	1018-277-1526	RD 1/4T 1.5K-J
R405	1018-277-1535	RD 1/4T 15K-J
R803	1018-277-1544	RD 1/4T 150K-J
R206, R211	1018-277-1623	RD 1/4T 1.6K-J
R517	1018-277-1818	RD 1/4T 180-J
R503	1018-277-2017	RD 1/4T 200-J
R409	1018-277-2211	RD 1/4T 220-J
R540, R304 } R507, R536 } R538, R509 } R509, R511 }	1018-277-2220	RD 1/4T 2.2K-J
R102, R314	1018-277-2239	RD 1/4T 22K-J
R807	1018-277-2243	RD 1/4T 220K-J
R533	1018-277-4757	RD 1/4T 4.7M-J
R201, R205	1018-277-2424	RD 1/4T 2.4K-J
R504	1018-277-2436	RD 1/4T 24K-J
R302, R306	1018-277-2442	RD 1/4T 240K-J
R426	1018-277-2716	RD 1/4T 270-J
R502, R101 } R601 }	1018-277-2725	RD 1/4T 2.7-J
R526	1018-277-2734	RD 1/4T 27K-J
R527	1018-276-3037	RD 1/4T 30K-G
R202, R317 } R508, R510 } R512, R607 } R611 }	1018-277-3313	RD 1/4T 330-J
R415	1018-277-3322	RD 1/4T 3.3K-J
R318	1018-277-3331	RD 1/4T 33K-J
R501	1018-277-3340	RD 1/4T 330K-J

Schematic Location	Supplier Part No.	Description
R404, R410 } R535, R537 } R539 }	1018-277-3623	RD 1/4T 3.6K-J
R224	1018-277-3632	RD 1/4T 36K-J
R520	1018-277-3915	RD 1/4T 390-J
R104, R213	1018-277-3924	RD 1/4T 3.9K-J
R307, R421		
R305	1018-277-3933	RD 1/4T 39K-J
R425, R105 } R309 }	1018-276-4333	RD 1/4T 43K-G
R222, R111	1018-277-4716	RD 1/4T 470-J
R319, R109	1018-277-4725	RD 1/4T 4.7K-J
R312, R313	1018-277-4734	RD 1/4T 47K-J
R529	1018-277-5119	RD 1/4T 510-J
R107	1018-277-5137	RD 1/4T 51K-J
R110, R301 } R608 }	1018-277-5623	RD 1/4T 5.6K-J
R227	1018-277-5632	RD 1/4T 56K-J
R218	1018-277-5641	RD 1/4T 560K-J
R308, R600	1018-277-6220	RD 1/4T 6.2K-J
R223	1018-277-6804	RD 1/4T 68-J
R528	1018-277-6813	RD 1/4T 680-J
R530, R204	1018-277-8211	RD 1/4T 820-J
R521, R532	1018-277-8239	RD 1/4T 82K-J
R219	1018-277-8248	RD 1/4T 820K-J
R412	1018-277-6202	RD 1/4T 62-J
R424	1018-377-1020	RD 1/2T 1K-J
R207	1018-376-1249	RD 1/2T 120K-G
R310	1018-377-2797	RD 1/2T 2.7-J
R406,	1018-377-2724	RD 1/2T 2.7K-J
R407	1018-377-3914	RD 1/2T 390-J
R221	1018-377-4715	RD 1/2T 470-J
R411,	1018-377-6803	RD 1/2T 68-J
R606	1018-277-3614	RD 1/4T 360-J
R614	1018-277-6831	RD 1/4T 68K-J
R-METAL OXIDE		
R316	1049-311-2500	RS 1/2P 1K-J
R413	1049-101-3506	RS 1P 1K-J
R514, R515 } R516 }	1049-313-3909	RS 1P 15K-J
R615	1049-101-5807	RS 1P 12K-J
R430	1049-315-1407	RS 2P 150-J

Schematic Location	Supplier Part No.	Description
R428	1049-103-1326	RS 2P 1.3K-J
R805	1049-315-3303	RS 2P 10K-J
R225	1049-103-510	RS 2P 47-J
R603	1049-313-5608	RS 1P 56-J
R-FUSIBLE		
R806	1059-001-0507	RF 1/4P 47-J
R408, R420	1059-002-0102	RF 1/2P 1-J
R423		
R115	1059-002-2209	RF 1/2P 22-J
R605	1059-002-8209	RF 1/2P 820-J
R422	1059-002-0403	RF 1/2P 68-J
R-METAL FILM		
R414	1049-974-2004	RM 1/4T 15K-G
R-COMPOSITION		
R522, R523	1028-328-4727	RC 1/2P 4.7K-K
R524		
POSITER		
R801	2189-605-0308	PTH 631D 01 BF 7R0M 140
R-CEMENT, WIRE		
R804	1039-901-0107	RP 3J 1.2-K
CAPACITOR		
C111		
C104	1507-121-5703	CQ921M 100V 0.068-K
C205, C514,	1417-104-2503	CK45B 50V 470-K
C601		
C305	1417-104-5605	CK45B 50V 560-K
C406	1417-104-2707	CK45B 50V 680-K
C201	1417-104-3304	CK45B 50V 330-K
C515, C109	1417-104-0707	CK45B 50V 270-K
C413	1419-901-1806	CK45B 2KV 270-K
C516	1417-104-1702	CK45B 50V 820-K
C519	1419-901-3204	CK45B 1KV 330-K
C105, C521	1407-105-0909	CC45 CH 50V 10-C
C108	1407-101-1407	CC45 SL 50V 12-J
C203	1407-105-2802	CC45 CH 50V 56-J
C511, C512	1407-101-2703	CC45 SL 50V 47-J
C513		
C100, C101	1417-109-1008	CK45F 50V 1000-Z
C102, C202		
C402, C502		
C503, C505	1417-109-1406	CK45F 50V 0.01M-Z
C517, C523		
C524, C525		
C603, C602		

Schematic Location	Supplier Part No.	Description
C509	1407-105-3205	CC45 CH 50V 82-J
C504	1409-105-1500	CC45 CH 50V 16-J
C506	1407-106-7606	CC45 RH 50V 150-J
C520	1407-105-3001	CC45 CH 50V 68-J
C528	1407-105-2608	CC45 CH 50V 47-J
C353, C354	1627-201-4902	CS 50V 2.2M-K
C352	1627-201-5800	CS 35V 0.22M-K
C303, C103	1507-121-1509	CQ921M 100V 0.015M-J
C204, C408	1507-121-1402	CQ921M 100V 0.01M-J
C306, C304		
C307	1507-121-5305	CQ921M 100V 0.033M-K
C308	1507-121-9101	CQ921M 100V 0.051M-J
C309, C409	1507-121-0300	CQ921M 100V 0.0015M-J
C605		
C310	1507-121-5305	CQ921M 100V 0.047 M-J
C311	1509-121-9202	CQ921M 100V 0.1M-M
C410	1419-104-4109	CK45B 50V 0.0022M-K
C403	1509-122-0307	DSR 50V 0.0036M-J
C404, C405	1507-121-1101	CQ921M 100V 0.0056M-J
C526, C527	1507-121-1800	CQ921M 100V 0.022M-J
C251, C254		
C358, C451	1607-402-2107	CE04W 50V 1M
C455, C551		
C153, C252	1607-401-4308	CE04W 25V 10M
C453		
C653, C654	1607-402-2505	CE04W 50V 10M
C253, C655		
C151, C351	1607-402-2000	CE04W 50V 0.47M
C553, C555		
C452		
C155, C152	1607-401-4609	CE04W 16V 47M
C154, C517		
C356	1609-401-5103	CE04W 16V 1000M VENT SNAP
C355	1607-402-4806	CE04W 50V 47M-W
C357	1609-402-1009	CE04W 35V 100M VENT SNAP
C456	1609-402-1300	CE04W 35V 470M VENT SNAP
C457	1609-401-7103	CE04W 25V 470M VENT SNAP
C458	1619-018-1502	CE04W 160V 33M-HR SNAP
C459	1619-018-1706	CE04W 250V 22M-HR SNAP
C554	1607-402-2408	CE04W 50V 4.7M
C851	1619-007-0406	200V 470M
C852	1609-403-3507	CE04W 180V 33M VENT SNAP
C411	1509-391-1100	OKR 1.6KV 0.0047M-J
C412	1509-391-0105	CQ922M 1600V 3000-J
C255, C651	1607-401-4706	CE04W 16V 100M-VENT
C454	1609-403-4502	CE04W 250V 1M
C552	1609-401-5006	CE04W 16V 470M-VENT
C604	1409-101-4503	CC45 CH50V 27-K
C606	1419-106-1100	CK45B 500V 680-K
C652	1607-402-2301	CE04W 50V 3.3M

Schematic Location	Supplier Part No.	Description
C656	1609-403-1905	CE04W 160V 3.3M
C657	1609-403-2007	CE04W 160V 4.7M
C415	1519-003-0207	CFS922M 400V 0.1M-K
C801, C802	1469-502-2201	AC 250V 0.0022M-Z
C803, C804		
C805, C806	1519-002-1403	ECQ-EW 250V ACO 22M-40/ + 85
COILS		
L101	2429-020-0106	0.5UH-K
L201	2427-805-4505	12UH-K
L202	2769-111-4106	TRF-5406 220R (P-50)
L403, L405	2429-014-0709	100UH-K
L404	2429-805-1106	1UH-K
L408	2429-805-9805	6800UH-K
L501	2429-805-4101	8.2UH-K
L502	2429-823-0107	330MH-K
L503, L504	2719-068-0205	7.2-13.2UH (4.43MHZ)
L505	2399-006-0107	20UH, K-16A (MAT-FBT)
L801	2429-903-6104	6MH
T101	2719-044-0104	LI1.37UH + -12 %
T171, T172	2719-045-0107	38.9MHZ
T401	2849-020-0108	50MH, K-16
SEMICONDUCTORS		
D201, D202 } D206, D302 } D401, D411 } D412, D601 }	2167-406-4804	IN4148
D205, D405 } D301 }	2167-201-0704	IN4003
	(S) 2169-301-6309	RH-1
	(A) 2169-208-5704	ERB29-04
D404, D407 } D408 }	(S) 2169-206-1106	S5295G
	(A) 2169-218-1307	RU-1
	(B) 2169-208-5102	ERB43-04
D801, D802 } D803, D804 }	2169-103-0802	IS1888 (FA-1)
D501 } D406, D101 } Q201 }	2169-408-0703	EQA02-23AC
	2167-408-0606	EQA02-12AB
	(S) 2139-101-5301	2SA 562 TM-O
	(A) 2139-103-4302	KSA642-O
Q402, Q101 }	(S) 2139-304-5609	2SC212-O
	(A) 2139-304-5706	2SC2120-Y
	(B) 2139-301-5503	KSC2331-O
Q403 }	(S) 2139-305-9301	2SC2229-Y
	(A) 2139-305-9204	2SC2229-O
	(B) 2139-301-5105	KSC2310-O
Q404 } Q801 }	2139-401-1308	2SD1398
	2119-601-5005	STR3125
Q501, Q502 } Q503 }	(S) 2139-301-1406	2SC2482 (FA-1)
	(A) 2139-301-5309	KSC2330-O
	(B) 2139-301-5406	KSC2330-Y
IC101 }	2119-102-0503	LA7520
IC301 }	2119-102-5702	AN5512
IC501 }	2109-303-0402	SS/TA7698 P/AP

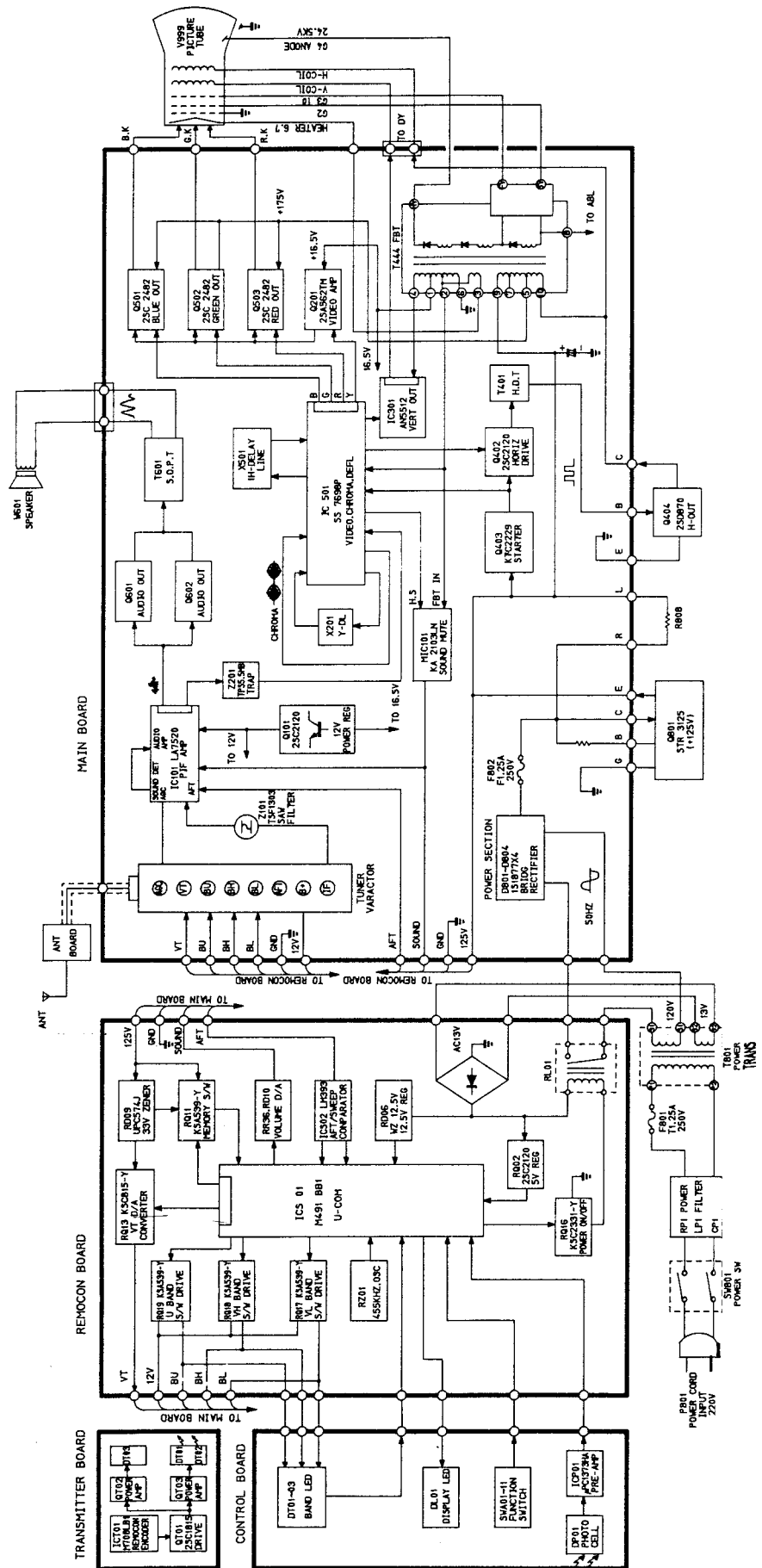
Schematic Location	Supplier Part No.	Description
VARIABLE RESISTORS		
VR101	1249-123-0152	CET 92A B10K
VR201	1201-106-0038	18EN 22F B500
VR203	1249-125-0088	CET 115A B2K
VR202, VR501	1201-106-0047	18EN 22F B10K
VR302, VR401	1249-125-0024	CET 115AB10K
VR301	1201-106-0095	18EN 22F B250K
VR502, VR503	1249-125-0033	CET 115A B5K
VR504		
VR505, VR506	1249-123-0161	CET 92A B200
VR507	1249-124-0067	CET 115A B1K
VR508	1249-124-0037	CET-92A B5K
MISCELLANEOUS		
X201	2469-011-7103	DL 6014434-S.S.
X501	2469-105-0409	EFD-EN645A 11G
X555	4539-040-0108	HC-18/U 4,433619MHZ
Z101	4529-030-0607	TSF 1303
Z201	4529-432-0104	TPS-5.5MB
Z601	4529-317-0108	SFE-5.5MB
Z602	4529-439-3100	CDA-5.5MC 24B
TU001	• 4519-909-4102	VTS-ISZ3 (IN CASE OF CABLE TV)
	• 4519-909-1107	VTS-ICZ3 (FTZ NORMAL)
F801	4709-060-0208	250V T1.25A 20MM SEMKO
F802	4709-086-0509	F250V 1.25A 20MM SEMKO
REMOCON BOARD		
RR01	1018-277-3915	RD ¼ T 390-J
RR02	1049-101-2608	RS 1P 68-J
RR03	1018-277-3021	RD ¼ T 3K-J
RR04	1059-002-0403	RF ½ P 68-J
RR05	1059-002-0102	RF ½ P 1-J
RR11	1018-277-6822	RD ¼ T 6.8K-J
RR12	1018-277-4725	RD ¼ T 4.7K-J
RR14	1049-427-2429	RS 2P 2.4K-J
RR15	1049-315-3303	RS 2P 10K-J
RR16	1049-275-1629	RD ¼ T 1.6K-F
RR17	1049-974-6800	RM ¼ T 6.9K-F
RR18, RR20	1018-277-3331	RD ¼ T 33K-J
RR21	101 -277-4638	RD ¼ T 56K-J
RR22, RR74	1018-277-8239	RD ¼ T 82-J
RR23, RR35	1018-277-6822	RD ¼ T 6.8K-J
RR34		
RR24	1018-277-1526	RD ¼ T 1.5K-J
RR25	1018-277-3924	RD ¼ T 3.9K-J
RR26	1018-277-3322	RD ¼ T 3.3K-J
RR27	1018-277-2220	RD ¼ T 2.2K-J
RR28, RR29	1018-277-4731	RD ¼ T 47K-J
RR90	1018-277-1049	RD ¼ T 100K-J

Schematic Location	Supplier Part No.	Description
RR30	1018-277-3322	RD ¼ T 3.3K-J
RR31, RR32	1018-277-4327	RD ¼ T 4.3K-J
RR33,	1018-277-1030	RD ¼ T 10K-J
RR36	1018-277-622	RD ¼ T 6.2K-J
RR42, RR46		
RR43, RR47	1018-277-1012	RD ¼ T 100-J
RR44, RR48		
RR45, RR67		
RR60		
RR49	1018-277-1030	RD ¼ T 10K-J
RR50	1018-277-4725	RD ¼ T 4.7-J
RR51, RR55		
RR52, RR56	1018-277-6813	RD ¼ T 680-J
RR53, RR57		
RR54, RR58		
RR59, RR64	1018-277-8220	RD ¼ T 8.2K-J
RR62		
RR73	1018-277-1049	RD ¼ T 100K-J
RR91, RR93	1018-277-1521	RD ¼ P 1.5K-J
RR92		
RC01	1609-401-7200	CE04W 25V 1000M-VENT
RC03	1607-401-6706	CE04W TAPG 25V47M
RC04	1707-401-4308	CE04W TAPG 25V 10M
RC05, RC06	1607-401-6706	CE04W TAPG 25V 47M
RC10	1417-109-1406	CK45 TAPG F 50V 0.01M-Z
RC11	1607-402-2709	CE04W TAPG 50V 33M (SEP)
RC12	1509-121-5901	CQ921M 100V 0.1M-K
RC13	1409-121-6100	CQ921M 100V 0.15M-K
RC14, RC15	1509-121-5901	CQ921M 100V 0.1M-K
RC16, RC21	1407-121-4300	CQ921M TAPG 100V 0.0047-K
RC17, RC18	1407-105-6608	CC45 TAPG CH 50V100-J
RC19	1607-402-2107	CE04 TAPG 59V 1M
RC21	1407-121-0106	CQ921M TAPG 100V 0.001M-J
RC22, RC23		
RC24, RC25	1417-109-1406	CK45 TAPG F 50V 0.01M-Z
RC26, RC27		
RC28, RC29		
RD01, RD02		
RD03, RD04	2167-201-0704	IN4003 TAPG/ DS4003 TAPG
RD07		
RD10, RD11	2167-406-4804	1N4148 TAPG/ DS4148 TAPG
RD06	2169-403-750	RD12EB(2)
RD08	2167-408-0509	EQA 02-04AB TAPG
RD09	2119-103-0603	UPC574J
ICS01	2119-202-3701	M4918B1
ICS02	2119-201-1203	LM393
RZ01	4539-016-0103	CSB455E/FOR 455K
RL01	4729-001-0302	DH12DI-O(M)
RQ02, RQ16	2137-301-5606	KSC2331-Y (TAPG)
RQ11	2137-401-5304	KSA539-Y (TAPG)
RQ12	2137-301-0202	KSC2073
RQ13	2137-301-7208	KSC815-Y (TAPG)
RQ17, RQ19	2137-401-5304	KSA539-Y (TAPG)
RQ18		

Schematic Location	Supplier Part No.	Description
TRANSMITTER BOARD		
RT04	1018-277-2793	RD ¼ T 2.7-J
RT02	1018-277-1035	RD ¼ T 10K-J
RT05	1018-227-4793	RD ¼ T 4.7-J
RT06	1018-227-2702	RD ¼ T 27-J
CT01, CT02	1409-106-3600	CC45 RH 50V 100-J
CT03	1609-401-1006	DE04W 6.3V 100M
DT01, DT02	2309-115-3101	SE303A
DT03	2309-115-6106	KLR124E
CX01	4539-050-0109	CSB455EBL
QT01	2159-101-5301	2SA562 TM-O
QT02, QT03	2139-101-5301	2SA562 TM-O
ICT01	2119-202-3808	M708LBI
CONTROL BOARD		
RP01	1018-227-1029	RD ¼ T 1K-J
RP02	1018-227-1056	RD ¼ T 1M-J
RP03	1018-227-2200	RD ¼ T 22-J
RP04	1018-227-2021	RD ¼ T 2K-J
CP01	1419-109-1002	CK45 F 50V 1000-Z
CP03	1609-401-4302	CE04W 25V 10M
CP04	1609-402-0703	CE04W 35V 22M
CP05	1609-401-4302	CE04W 25V 10M
CP06	1609-401-6700	CE04W 25V 25V 47M
LP01	2329-904-5607	18MH-K
DPO1	2199-002-1004	H3MLR (F)
ICP01	2109-301-6008	UPC 1373 H/HA
DL01	2309-112-2709	LN524RAL-SA
DT01	2309-115-6106	KLR124E
DT02	2309-115-4106	KLK 124E
DT03	2309-115-5101	KLY 124E
DT04, DT05	2169-406-4808	1N4148
RR72	1018-227-1017	RD ¼ P 100-J
MISCELLANEOUS		
SW01, SW02	3529-130-4100	KEC 10902/KPT-1106
SW03, SW04		
SW06, SW06		
SW07, SW08		

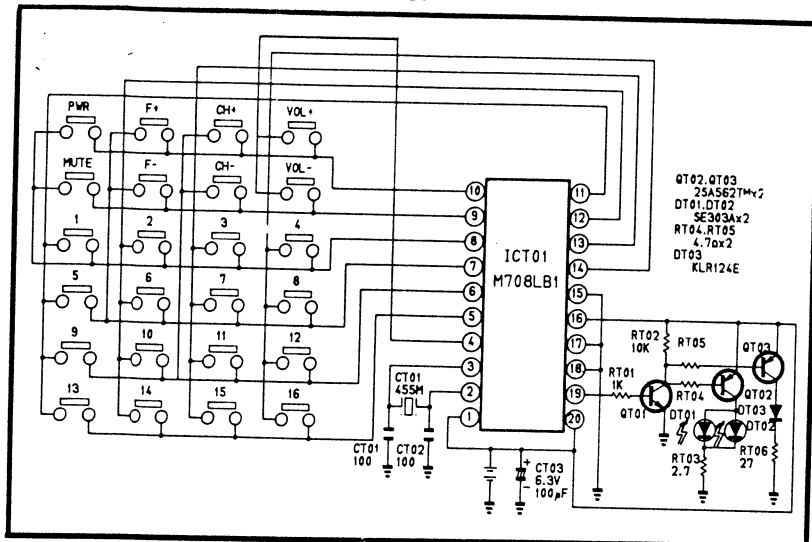
INCH Schematic Location	14"		20"	
	Supplier Part No.	Description	Supplier Part No.	Description
R208	1049-905-8903	RM 1/4P 127K-F	1049-905-8806	RM 1/4P 110K-F
R315	1049-427-2410	RS 1P 240-J	1049-101-5117	RS 1P 430-J
R609	1018-227-1549	RD 1/4P 150K-J	1018-227-2243	RD 1/4P 220K-J
R612	1018-227-2720	RD 1/4P 2.7K-J	1018-227-3929	RD 1/4P 3.9K-J
R613	1018-227-1026	RD 1/4P 1K-J	1018-227-1521	RD 1/4P 1.5K-J
R616	1049-101-1515	RS 1P 150-J	1059-002-2209	RF 1/4P 22-J
R808	1039-916-6009	RC 20B 300-J	1039-917-2507	RC 20B 250-J
C414	1519-002-5306	CFS 922M 200V 0.47M-J	1566-631-4345	CFS 922M 400V 0.43-J
L401	2449-705-0209	DS 48-157UH	2449-712-0104	K-101 195UH
L406	2439-076-0104	DID-1492HL	2439-090-0106	DIE-1992GL
T402	2779-114-0100	K-20-14	2779-110-0117	K-10-19
T444	2859-135-0106	FCM-1415AL	2859-136-010	FCM-2015AL
T601	2789-550-0307	1.1K :8R(P.C.B)S	2789-537-0209	500 : 8R 28MN
T801	2869-197-0318	P: 220V S: 120V	2869-196-0917	P: 220V S: 120V
Q601, Q602	2139-301-540	KSC 2230A-Y	2139-301-2304	KSC 1507-O
V999	2019-230-6108	3701B 22	2019-270-8102	5106B 22

P-50 CHASSIS REMOCON SYSTEM BLOCK DIAGRAM

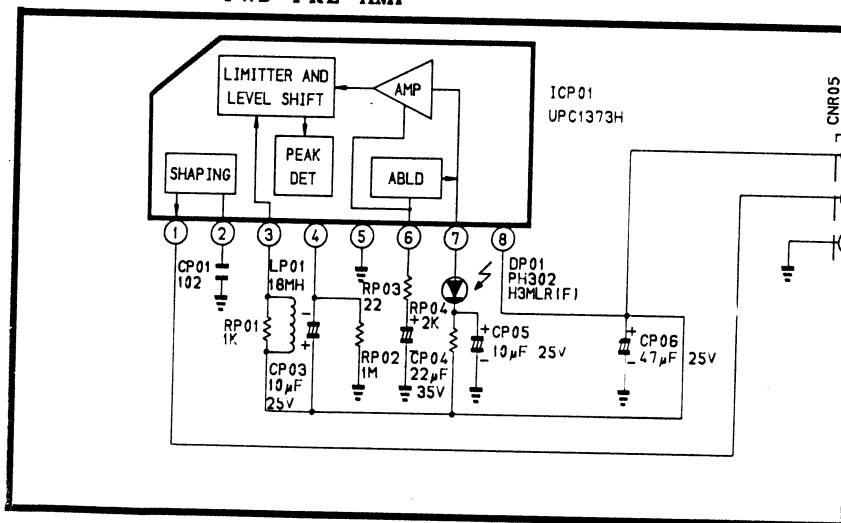


MEMO

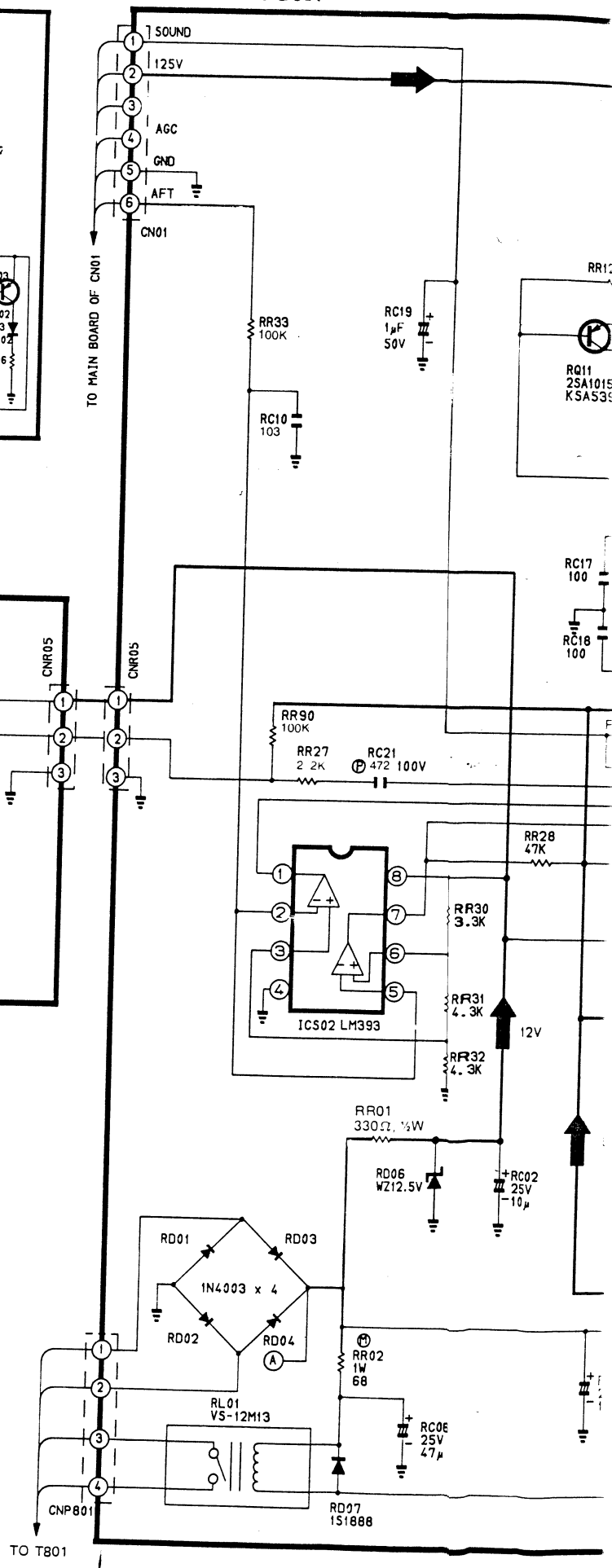
PWB-TRANSMITTER



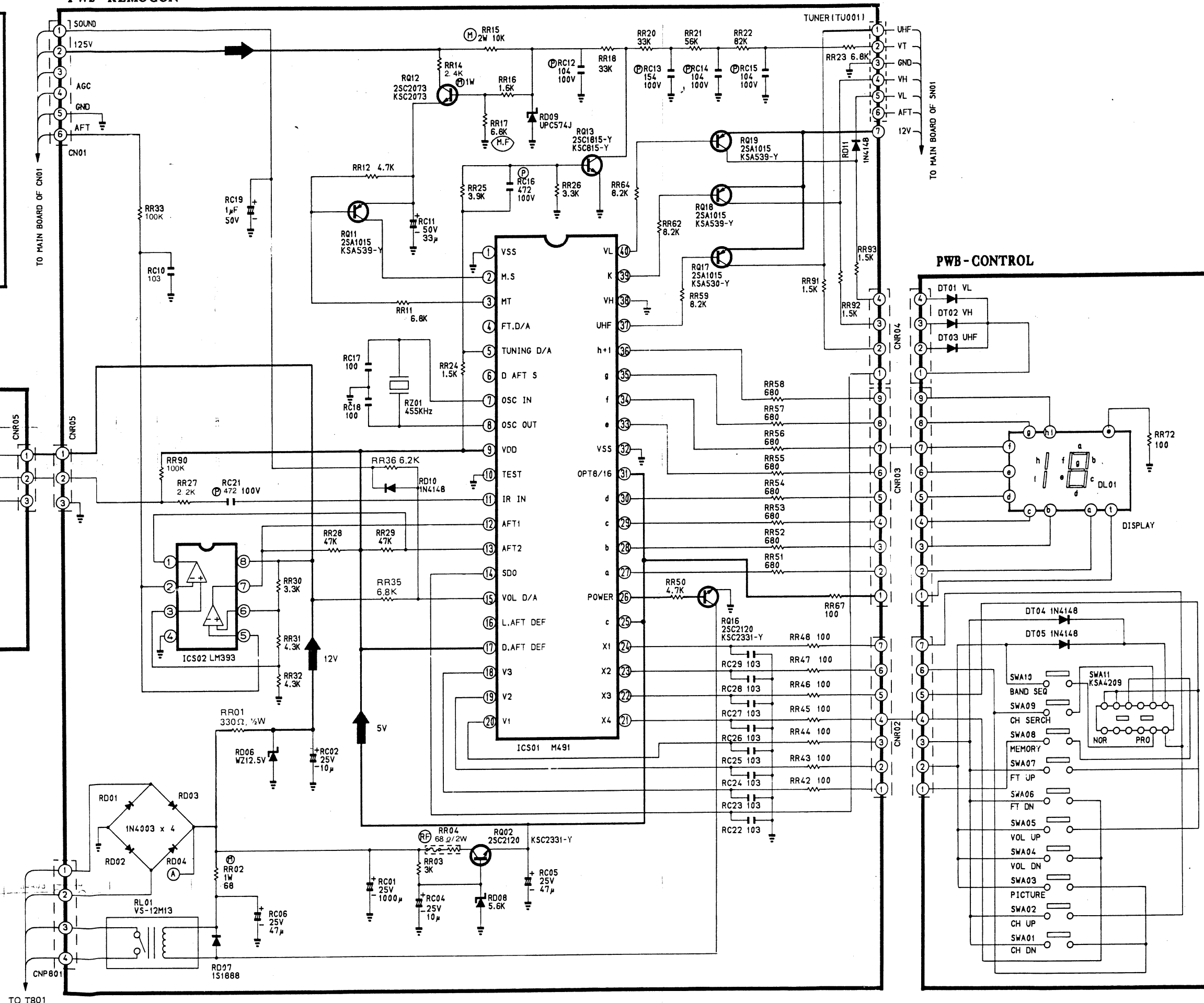
PWB-PRE AMP



PWB-REMOCON



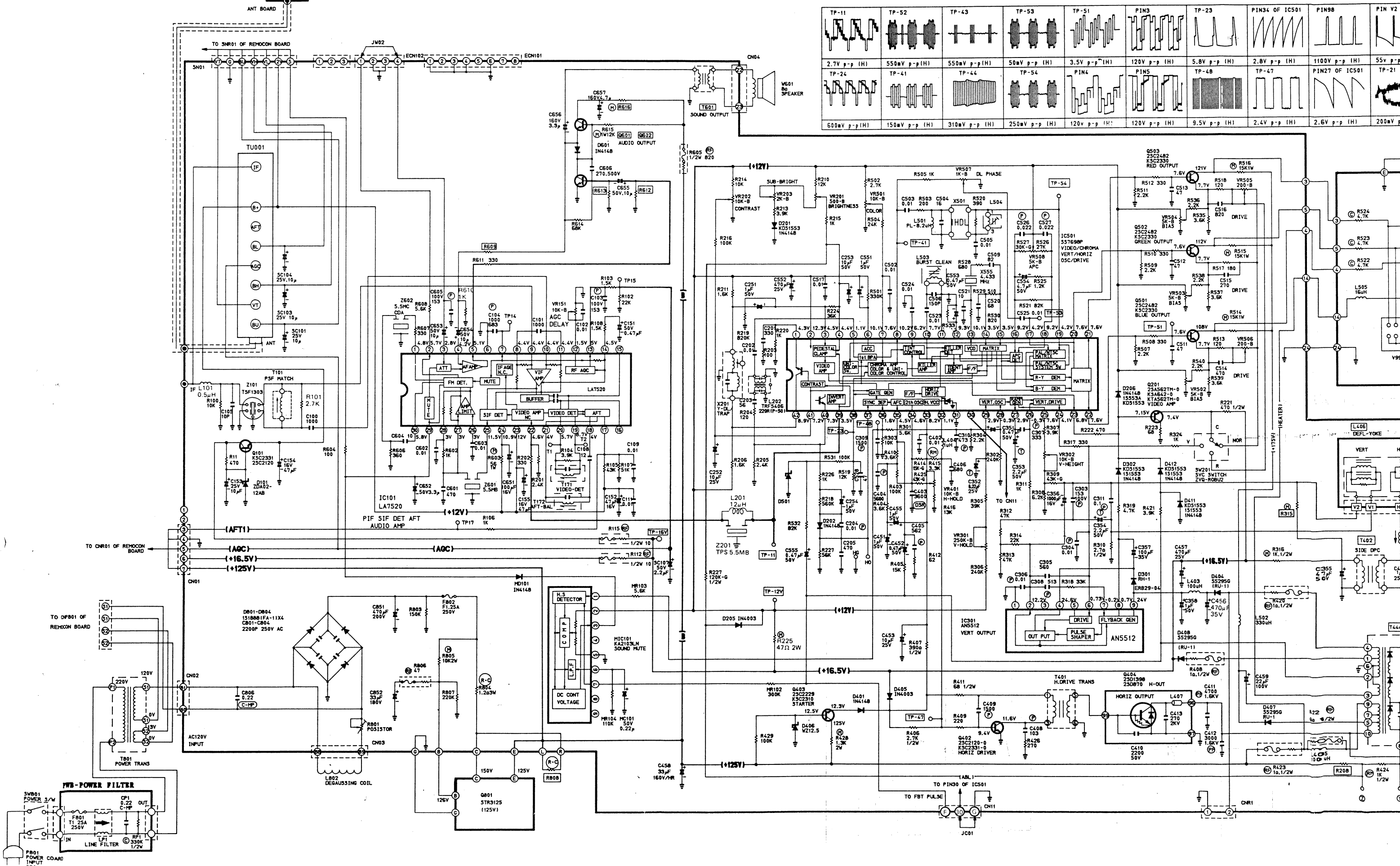
CNR05



SCHEMATIC DIAGRAM

CHASSIS NO.: P-50

REMOTE CONTROL SYSTEM RM-097



EXPRESSION

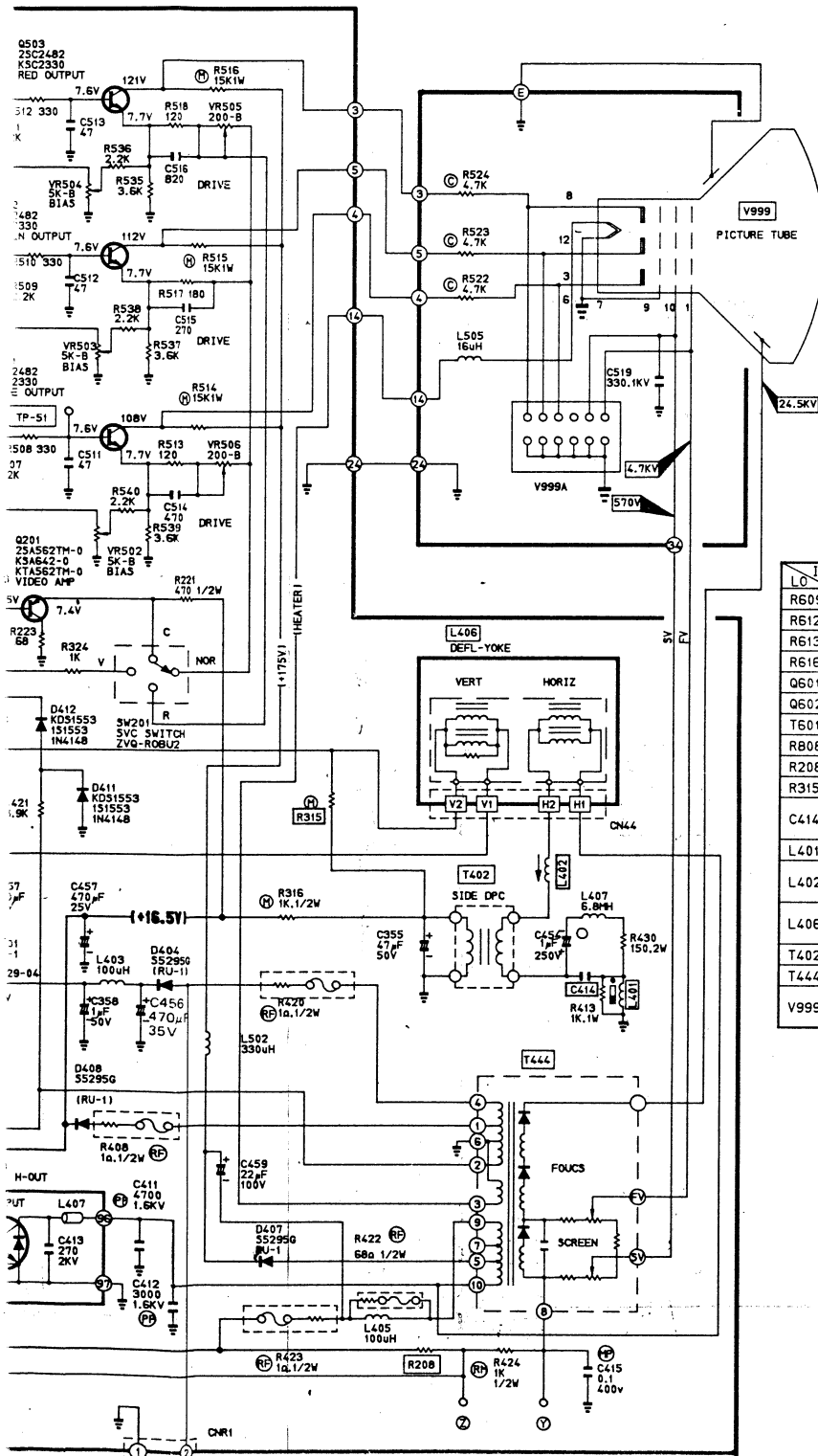
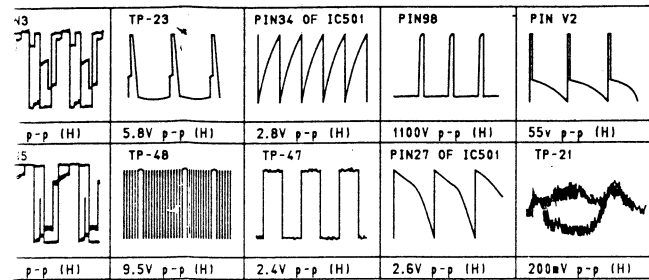
- Resistance is shown ohm K=1,000 M=1,000,000.
- Unless otherwise noted in schematic all capacitor values less than 1 are expressed in mfd, the values more than 1 in pF.
- Unless otherwise noted in schematic all inductor values are expressed in uH, and the values less than 1 in mH.

NOTE

The circuits are subject to change without notice to improve the picture quality.

RESISTOR	
TYPE	MARK
Carbon Composition	C
Oxide Metal Film	M
Metal Film	RM
Cement	R-C
Variable Resistor	
Positive Resistor	

CAPACITOR	
TYPE	MARK
Ceramic	No Mark
Polyester	P
Tantalum	T
Metal Polyester	MP
Polypropylene	P.P
Polyester Polypro	DSR
Chemical Electrolytic	
Chemical Non-Polar	



IN	14"	20"
R609	150K	220K
R612	2.7K	3.9K
R613	1K	1.5K
R616	150.1W	22.1/2W
Q601	KSC2230A-Y	KSC1507-0
Q602	S2230A-Y	KSC1507-0
T601	1.1K:8R	500:8R
R808	(R-O) 300a 20W	(R-C) 250a 20W
R208	(RM) 127K-F.1/2W	(RM) 110K-F.1/2W
R315	(M) 240 1W	(M) 430 1W
C414	(P.P) 0.47.200V	(P.P) 0.43.400V
L401	157uH	195uH
L402	*	*
L406	DIE-1492HL	DIE-1992GL
T402	K-20-14	K-10-19
T444	FCM-1415AL	FCM-2015AL
V999	3701B22.4201B22	5105B22.510UXB22
	*A37-573X	*A51-570X

MEMO